KAISER•HILL
COMPANY

Final
Comprehensive Risk Assessment Work Plan and Methodology

Environmental Restoration
Rocky Flats Environmental Technology Site

September 2005
Revision 1

Department of Energy

ROCKY FLATS PROJECT OFFICE
12101 AIRPORT WAY, UNIT A
BROOMFIELD, COLORADO 80021-2583

OCT 2 6 2005

05-DOE-00616

Mr. Carl Spreng
Rocky Flats Cleanup Agreement Project Coordinator
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80246-1502

Mr. Mark Aguilar
Rocky Flats Cleanup Agreement Team Leader
U.S. Environmental Protection Agency, Region VIII
999 18th Street, Suite 300
Denver, Colorado 80202-2466

Dear Gentlemen:

The U.S. Department of Energy Rocky Flats Project Office is pleased to transmit the Final Comprehensive Risk Assessment Work Plan and Methodology – Revision 1. Enclosed are copies of the Final Work Plan and Methodology for your approval. Previous comments have been incorporated and contact records are included as Appendix C.

If you have any questions please contact Norma Castaneda at (303) 966-4225, or you may contact me at (303) 966-6246.

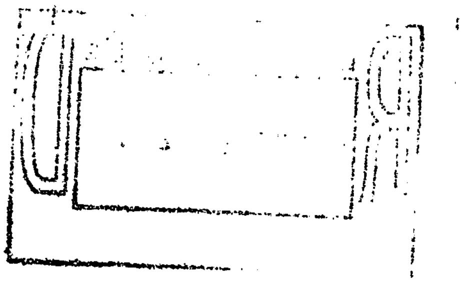
Sincerely,

Ron Baster

for John J. Rampe, Director
RFPO Closure Project Management

Enclosures:

cc w/Encls.:
N. Castaneda, HQCPM, RFPO
S. Griffin, USEPA
R. Blackburn, USEPA
R. Goyal, CDPHE
J. Keating, K-H
Administrative Record



Final
Comprehensive Risk Assessment
Work Plan and Methodology

September 2005
Revision 1

2

TABLE OF CONTENTS

3

4

LIST OF TABLES

LIST OF FIGURES

5

LIST OF APPENDICES

6

ACRONYMS

95UCL	upper confidence limit of the mean at a 95 percent level
AL	action level
BAF	bioaccumulation factor
BDAC	Biological Dose Assessment Committee
BOA	Basic Ordering Agreement
BZ	Buffer Zone
CAD/ROD	Corrective Action Decision/Record of Decision
CAS	Chemical Abstract Service
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CNS	central nervous systems
COC	contaminant of concern
CRA	Comprehensive Risk Assessment
CRAVE	Carcinogenic Risk Assessment Verification Endeavor
CRQL	contract-required quantitation limit
CSF	cancer slope factor
DAD	dermally absorbed dose
DAR	Data Adequacy Report
DCF	dose conversion factor
DER	duplicate error ratio
DOE	U.S. Department of Energy
DQA	Data Quality Assessment
DQO	data quality objective
DRI	daily reference intake
ECOC	ecological contaminant of concern
ECOI	ecological contaminant of interest
ECOPC	ecological contaminant of potential concern
Eco-SSL	ecological soil screening level
Eh	reduction-oxidation potential
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
ERA	ecological risk assessment
ESL	ecological screening level
ESOD	Erythrocyte superoxide dismutase

1

ACRONYMS

EU	exposure unit
HEAST	Health Effects Assessment Summary Tables
HHRA	human health risk assessment
HI	hazard index
HI_{es}	HI for the exposure scenario
HI_{to}	HI by target organ
HQ	hazard quotient
I	insignificant
IA	Industrial Area
IASAP	Industrial Area Sampling and Analysis Plan
IABZSAP	Industrial Area and Buffer Zone Sampling and Analysis Plan
IC	incomplete
ICA	Institutional Control Area
ICRP	International Commission on Radiological Protection
IHSS	Individual Hazardous Substance Site
IRIS	Integrated Risk Information System
LHSU	lower hydrostratigraphic unit
LOAEL	lowest observed adverse effect level
MARSSIM	Multi-Agency Radiological Survey and Site Investigation Manual
MDL	method detection limit
NOAEL	no observed adverse effect level
ORNL	Oak Ridge National Laboratory
OU	Operable Unit
PAC	Potential Area of Concern
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
PCOC	potential contaminant of concern
Pe	electron activity
pH	hydrogen ion activity
PMJM	Preble's meadow jumping mouse
PPRTV	provisional peer reviewed toxicity value
PQL	practical quantitation limit

8

ACRONYMS

PRG	preliminary remediation goal
RCRA	Resource Conservation and Recovery Act
RESRAD	Residual Radioactivity Computer Code
RFCA	Rocky Flats Cleanup Agreement
RfD	reference dose
RFETS or Site	Rocky Flats Environmental Technology Site
RFI/RI	RCRA Facility Investigation/Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RL	reporting limit
RMA	Rocky Mountain Arsenal
RME	reasonable maximum exposure
ROC	receptor of concern
RPD	relative percent difference
RSAL	radionuclide soil action level
S	significant
SAP	Sampling and Analysis Plan
SCM	site conceptual model
SCMTM	Sitewide Conceptual Model Technical Memorandum
SMDP	scientific management decision point
STSC	Superfund Health Risk Technical Support Center
tESL	threshold ecological screening level
TRV	toxicity reference value
TSS	total suspended solids
UBC	Under Building Contamination
UCL	upper confidence limit
UHSU	upper hydrostratigraphic unit
UL	upper limit daily nutrient intake
USFWS	U.S. Fish and Wildlife Service
V&V	verification and validation
WQC	water quality criteria
WOE	weight of evidence
WRV	wildlife refuge visitor

9

ACRONYMS

WRW	wildlife refuge worker

10

UNIT DESCRIPTIONS

95UCL	upper confidence limit of the mean at a 95 percent level
°C	degrees Celsius (or Centigrade)
cm	centimeter
cm^2	square centimeter
cm^3	cubic centimeter
cm^3/cm^3	cubic centimeter per cubic centimeter
day/yr	days per year
ft	foot
g/kg	grams per kilogram
g/mg	grams per milligram
hr	hour
hr/day	hours per day
kg	kilogram
kg/m^3	kilograms per cubic meter
kg/mg	kilograms per milligram
L/day	liters per day
L/hr	liters per hour
m	meter
m^3	cubic meter
$m^3/\mu g$	cubic meters per microgram
m^3/day	cubic meters per day
m^3/hr	cubic meters per hour
m^3/kg	cubic meters per kilogram
m^3-yr/kg-day	cubic meter-year per kilogram-day
mg/cm^2	milligrams per square centimeter
mg/cm^2-event	milligrams per square centimeter-event
mg/day	milligrams per day
mg/kg	milligrams per kilogram

UNIT DESCRIPTIONS

mg/kg-day	milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$	one divided by (mg/kg-day)
mg/kg BW/day	milligrams per kilogram per body weight per day
$mg/kg\ BW/day^{-1}$	one divided by (mg/kg BW/day)
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
mg-yr/kg-day	milligram-year per kilogram per day
pCi	picocurie
pCi/g	picocuries per gram
pCi/L	picocuries per liter
%	percent
rad/day	rad per day
risk/pCi	risk per picocurie
risk/yr/pCi/g	risk per year per picocurie per gram
risk/(mg/kg-day)	risk per milligram per kilogram-day
yr	year
yr/pCi/g	years per picocurie per gram
yr-pCi/g	year-picocurie per gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter

12

1.0 INTRODUCTION

This document was prepared under Task 8, Prepare the Comprehensive Risk Assessment (CRA) Work Plan, of the Final Work Plan for the Development of the Remedial Investigation/ Feasibility Study (RI/FS) (DOE 2002a), and describes the scope, activities, and methodology for the Draft CRA. The Draft CRA is referred to hereafter as the CRA. The purpose of the CRA is to assess human health and ecological risks[1] posed by chemicals, metals, and radionuclides remaining at the Rocky Flats Environmental Technology Site (RFETS or Site) following accelerated actions. The CRA will support the Draft RI/FS Detailed Analysis of Alternatives, Proposed Plan, and Corrective Action Decision/Record of Decision (CAD/ROD) for the Site.

The activities associated with Task 8 of the RI/FS Final Work Plan have evolved since publication of the document. Task 8 identifies 10 items that were to be presented in this document:

1. Data quality objectives (DQOs);
2. Site conceptual model (SCM), including exposure scenarios, exposure pathways, and receptors;
3. Final list of contaminants of concern (COCs) following statistical evaluation and preliminary screening;
4. Reasonably foreseeable anticipated land use and use restrictions for the Site;
5. Background concentrations for COCs;
6. Established detection limits for COCs;
7. COC physical and chemical characteristics;
8. Methods for conducting the exposure assessment, toxicity assessment, and risk characterization;
9. Fate and transport models used to predict exposure point concentrations (EPCs); and
10. Preliminary remediation goals (PRGs) for surface soil, sediments, and groundwater from a human health and ecological perspective.

Items 1, 2, 4, 8, and 10 are developed in this document. Items 3, 5, and 7 will be completed using methods discussed herein and reported in the CRA. Item 6 was discussed in the separate Industrial Area (IA) and Buffer Zone (BZ) Sampling and Analysis Plans (SAPs) (DOE 2001, 2002b) and is also included in the combined IA and BZ SAP (IABZSAP) (DOE 2004a). Item 9 is discussed below in general and will be presented in depth in a separate groundwater modeling report. For Item 10, human health PRGs that have not been included in the Rocky Flats Cleanup Agreement (RFCA) will be referred to as "screening-level PRGs" to distinguish them from those that have been reviewed for inclusion in RFCA. These PRGs have been developed specifically for the CRA and will not be added to RFCA. Human health screening-level PRGs are presented in this document (Appendix A). Ecological screening levels (ESLs) have been developed in

[1] In this document, the term "risk" will be used to refer to the combined "lifetime excess cancer risk" for humans and noncarcinogenic health effects assessed using the hazard index (HI) for humans, and the calculated HQ for ecological receptors.

13

place of ecological PRGs and are presented in Appendix B. Regulatory contact records that document refinements to the CRA Methodology are included as Appendix C.

1.1 Comprehensive Risk Assessment Scope

> **Scope:** The CRA will quantify and report risks posed by residual contamination at the Site to human and ecological receptors after accelerated actions.

RFCA adopted an accelerated action cleanup approach to expedite remedial work and maximize early risk reduction at the Site, as described in RFCA paragraph 79 (DOE et al. 1996). The CRA will be conducted in a progressive approach as accelerated actions are completed and data on the nature and extent of contamination are collected during the Sitewide RI/FS effort. After accelerated actions, the need for further actions, if any, will be analyzed in the Draft RI/FS, hereafter referred to as the RI/FS. Risks to human and ecological receptors posed by residual contamination at the Site will be quantified and evaluated in the CRA. The CRA will be included in the RI/FS Report.

This document presents the Final CRA Work Plan and Methodology, hereafter referred to as the CRA Methodology. This CRA Methodology presents the approach to be used in the CRA including the SCM, exposure scenarios, exposure factors, toxicity assumptions, and risk characterization methodology. The CRA Methodology is a major revision to and supersedes the previously circulated Draft Methodology (DOE 2000). This revision was required due to the change of the reasonably anticipated future use of RFETS as a wildlife refuge as designated by the Rocky Flats National Wildlife Refuge Act of 2001. After completion of cleanup and closure, RFETS will become a National Wildlife Refuge in accordance with the Rocky Flats National Wildlife Refuge Act of 2001, PL 107-107, 16 U.S.C. § 668dd note (Refuge Act).This designation means it is unlikely that RFETS will be used for limited industrial, unrestricted open space, or on-site residential uses, and the associated exposure scenarios are no longer included in the current Methodology. The CRA is based on the assumption that the future land use for the Site will be a wildlife refuge, as designated by the Act.

The CRA will assess all areas within the RFETS boundary. For Operable Unit (OU) 3, Offsite Areas, a risk assessment was performed (DOE 1996a) and a CAD/ROD was issued (DOE 1997). The OU 3 risk assessment will be reviewed and summarized in the CRA. However, OU 3 will not be reassessed unless the on-site assessment indicates circumstances that could alter the conclusions of the earlier OU 3 assessment. Information that will be evaluated in this regard includes surface water and air monitoring data collected at the Site boundary, and new soil and surface water data collected during accelerated actions. Areas to be addressed within the RFETS boundary include areas containing existing or former OU designations. While CAD/RODs have been issued for some of these OUs (OUs 1, 11, 15, and 16), these areas are included to enable characterization of risk within each designated exposure unit (EU) and aquatic exposure unit (AEU) for the entire Site.

1.2 Technical Approach

The primary tasks required to complete the CRA, and their interrelationships, are detailed in this section. A generalized flow of the process is shown on Figure 1.1. Primary tasks included in this document are:

- Generate the SCMs for both human health and ecological assessments with all defined exposure pathways, receptors, and scenarios;
- Identify exposure factors;
- Develop EUs and AEUs;
- Update human health PRGs and develop human health screening levels for the CRA; and
- Develop ESLs for the CRA.

The human health risk assessment (HHRA) and ecological risk assessment (ERA) will be conducted in parallel. The CRA will assess human health and ecological risks from residual contamination using all available data including historical samples, monitoring data, and characterization and post-cleanup confirmation sampling results.

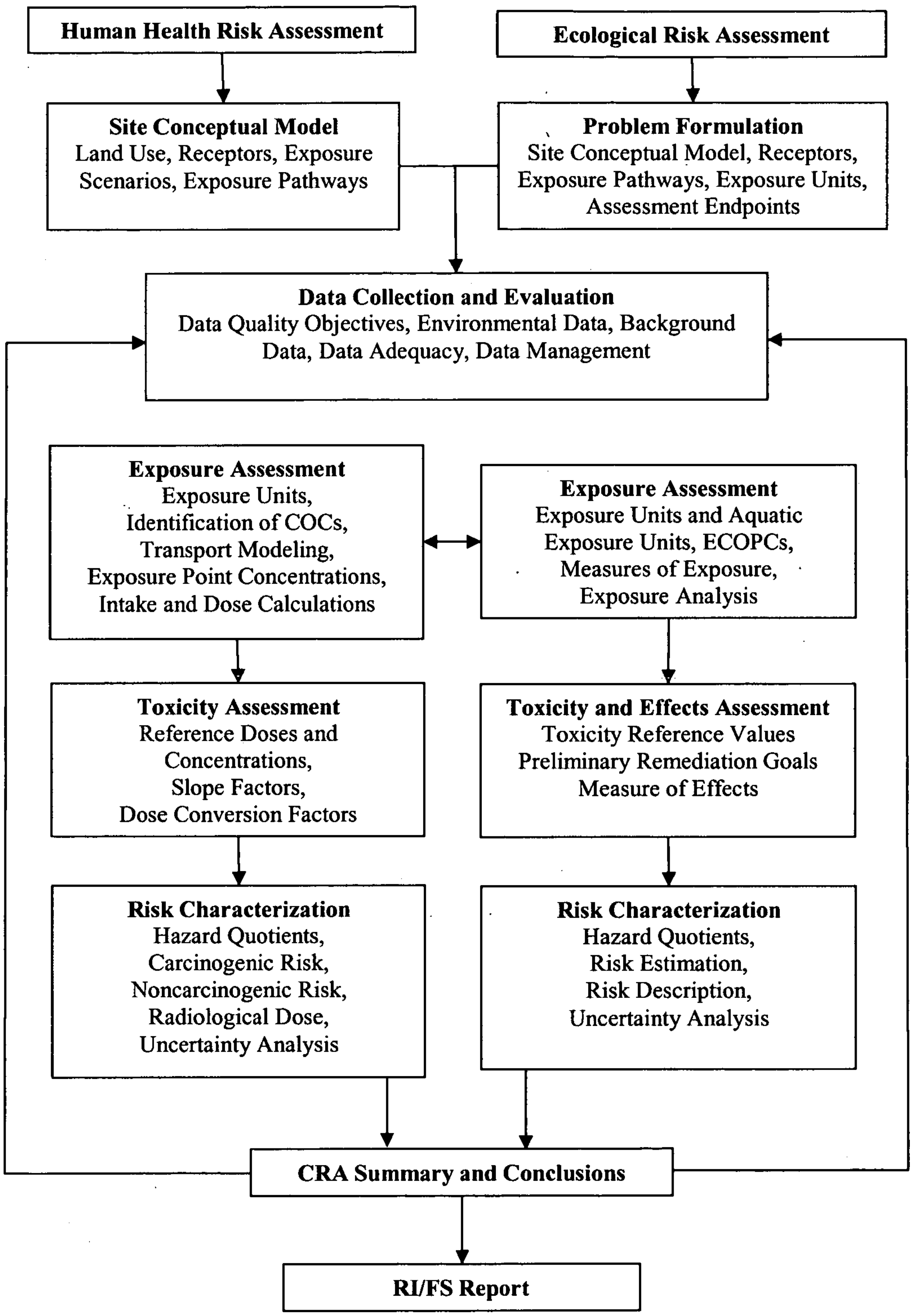
2.0 HUMAN HEALTH SITE CONCEPTUAL MODEL

Action: Develop an SCM of receptors, exposure scenarios, and exposure pathways to guide the CRA process.

The reasonably anticipated future land use for RFETS is a wildlife refuge. The U.S. Department of Energy (DOE) will be responsible for stewardship activities, such as monitoring and maintenance, within those areas associated with a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedy, as appropriate. Refuge workers are assumed to be present on site for most of the year and engaged in refuge maintenance and ecological work activities. A Comprehensive Conservation Plan is under development by the U.S. Fish and Wildlife Service (USFWS) (draft dated February 2004; anticipated completion of final in December 2004), in consultation with the Stakeholders. Specific refuge activities will be determined by this plan.

An exposure pathway describes a specific environmental route by which an individual receptor could be exposed to contaminants present at or originating from a site. After the primary source(s) and release mechanisms are identified for the site, the resulting secondary sources and secondary release mechanisms are identified and described. Subsequent sources and release mechanisms are identified until the exposure pathways for each contaminant are fully delineated. A complete exposure pathway includes five elements: source, mechanism of release, transport medium, exposure point, and intake route. If any of these elements are missing, the pathway is incomplete.

Figure 1.1 CRA Process



16

Exposure pathways and exposure routes in the SCM have been categorized as significant (S), insignificant (I), or incomplete (IC) using best professional judgment in consultation with the U.S. Environmental Protection Agency (EPA), Colorado Department of Public Health and Environment (CDPHE), and USFWS. All such judgment will be supported by an analysis of the available evidence. The rationale and justification for the classification of all exposure pathways will be included in the CRA Report. Significant and insignificant exposure pathways are complete exposure pathways. Significant exposure pathways contribute the major portion of risk or dose. An insignificant pathway is complete but will not contribute significantly to the total risk or dose. An incomplete exposure pathway is missing one or more of the five elements necessary for a complete exposure pathway. With an incomplete pathway, there will be no exposure, and the pathway will not contribute any risk or dose. All significant exposure pathways will be quantitatively assessed at RFETS, while insignificant and incomplete exposure pathways will be qualitatively addressed.

The comprehensive human health SCM, including all potentially viable exposure scenarios and pathways, is presented on Figure 2.1. Receptors in the SCM are described in detail below. Exposure factors for each significant pathway are presented in Section 4.0.

2.1 Receptors

The Rocky Flats National Wildlife Refuge Act (2001) establishes a wildlife refuge as the future land use of the Site. Two types of receptors are associated with the wildlife refuge land use: the wildlife refuge worker (WRW) and the wildlife refuge visitor (WRV). These scenarios are evaluated in the SCM and will be assessed in the CRA. It is assumed that the WRW is exposed to outdoor contaminants for an average of one-half the workday. Current planning by USFWS does not include year-round offices or an on-site visitor center. A seasonally staffed visitor contact station may be built on the western side of the Site (USFWS 2004). If an office/visitor center was built on site, there could be exposures to contaminants transported into the building for an average of one-half the workday for the WRW. This potential exposure for the WRW will be assessed in each EU. The WRV will have very limited exposures to indoor contaminants. Primary exposures will be to outdoor contaminants. Therefore, indoor exposures will not be assessed for the WRV.

Risks to an off-site resident were assessed in the OU 3 Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation (RFI/RI) performed in 1996 (DOE 1996a). Monitoring at the Site boundaries since completion of the RFI/RI indicates there have been no releases from the Site that would alter the conclusions of the 1996 assessment. Unless the on-site assessment indicates circumstances that could alter the conclusions of the 1996 OU 3 assessment, risks to the off-site resident will not be assessed. Current risks to an off-site receptor due to air transport are assessed in the annual National Emission Standards for Hazardous Air Pollutants Report for Radionuclides and the Annual Dose Assessment Report. The on-site resident will not be assessed because residential use is not a reasonably anticipated land use.

Ecological receptors have been identified and will be assessed in appropriate habitats as discussed in Section 7.0. The key ecological receptors have been selected to adequately represent the local ecological community and quantify the range of potential impacts.

17

Figure 2.1 Human Health Site Conceptual Model

Primary Source	Primary Release Mechanism	Affected Media	Secondary Release Mechanism	Affected Media	Wildlife Refuge Worker Exposure Pathways	Wildlife Refuge Visitor Exposure Pathways
Surface Soil, Subsurface Soil, Sediment, and Building Rubble	Stormwater Runoff	Surface Water Streams/Seeps	Direct Contact		Oral (I) Dermal (I)	Oral (I) Dermal (I)
			Biotic Uptake	Fish	Oral (IC)	Oral (IC)
			Ingestion	Deer/Grazing Animals	Oral (IC)	Oral (I)
	Infiltration Percolation	UHSU Groundwater	Percolation	LHSU Groundwater	Oral (IC) Dermal (IC)	Oral (IC) Dermal (IC)
			Domestic Use		Oral (IC) Dermal (IC)	Oral (IC) Dermal (IC)
			Surface Water		Oral (I) Dermal (I)	Oral (I) Dermal (I)
	Volatilization	Groundwater Subsurface Soil	Volatilization	Indoor Air	Inhalation (I)	Inhalation (IC)
				Outdoor Air	Inhalation (I)	Inhalation (I)
		Surface Water	Volatilization	Outdoor Air	Inhalation (I)	Inhalation (I)
	Resuspension	Airborne Particulates		Indoor Air	Inhalation (S)	Inhalation (IC)
				Outdoor Air	Inhalation (S)	Inhalation (S)
			Deposition	Deer/Grazing Animals	Oral (IC)	Oral (I)
	Plant Uptake	Vegetation	Ingestion	Deer/Grazing Animals	Oral (IC)	Oral (I)
	Direct Contact	Surface Soil (0 to 0.5 foot)[a]			Oral (S) Dermal (S[b])	Oral (S) Dermal (S[c])
		Subsurface Soil (0.5 to 8 feet)			Oral (S) Dermal (S[b])	Oral (IC) Dermal (IC)
		Subsurface Soil (Below 8 feet)			Oral (IC) Dermal (IC)	Oral (IC) Dermal (IC)
		Sediment[a]			Oral (S) Dermal (S[b])	Oral (S[b]) Dermal (S[b])
		Building Rubble			Oral (IC) Dermal (IC)	Oral (IC) Dermal (IC)
	Radioactive Decay	Surface Soil			External Irradiation (S)	External Irradiation (S)
		Subsurface Soil			External Irradiation (I)	External Irradiation (I)
		Sediment			External Irradiation (S)	External Irradiation (I)
		Building Rubble			External Irradiation (I)	External Irradiation (I)

a. Surface soil and sediments to a depth of 0.5 foot will be combined for the exposure assessment.

b. Dermal exposures will be assessed for organic COCs only.

UHSU - upper hydrostratigraphic unit

LHSU – lower hydrostratigraphic unit

Key to Exposure Pathways:

S – Significant

I – Insignificant

IC – Incomplete

2.2 Human Health Exposure Scenarios

The following exposure scenarios define the exposure pathways and assumptions for the WRW and WRV. Insignificant and incomplete exposure pathways are also defined and discussed. Justification for the classifications of exposure pathways will be included in the CRA. If preliminary calculations or information suggest that a pathway is significant, the classification will be changed.

2.2.1 Wildlife Refuge Worker Exposure Scenario

The WRW scenario for the CRA (Section 4.1.2) is consistent with the WRW scenario used for development of RFETS radionuclide soil action levels (RSALs) (EPA et al. 2002). The CRA assumes that the WRW will spend 50 percent of his or her work-time outdoors on the Site and the remaining 50 percent of their work day will be spent in an indoor office. The WRW will conduct fieldwork on Site that will result in exposure to surface soil, subsurface soil, sediment, and surface water.

Monitoring, maintenance, and other long-term stewardship activities to implement and evaluate the continuing protectiveness of the comprehensive final remedy will occur on Site. The exposure parameters and pathways associated with these activities are contained within the WRW scenario. It is assumed that exposures due to monitoring, maintenance, and other stewardship activities will be less than that for the WRW scenario. This is because environmental workers will conduct work in accordance with appropriate Site Health and Safety Plans (as Site workers do currently) and appropriate protective equipment will be used. Consequently, these individuals will not be exposed to contaminants at any higher concentrations than those to which the WRW is exposed, and the exposure frequency will be low. Therefore, the WRW scenario provides an upper bound for risks due to these activities, and a specific "stewardship receptor" will not be assessed in the CRA.

Complete Exposure Pathways for the Wildlife Refuge Worker

Potentially complete exposure pathways from which exposures are expected for the WRW include:

- Ingestion of and dermal exposures to surface soil/sediments, subsurface soil, and surface water;
- Inhalation of volatiles and particulates; and
- External exposure to beta and gamma radiation from radionuclides present in soil, subsurface soil, sediments, and building rubble.

Complete and ***Significant Exposure Pathways for the Wildlife Refuge Worker***

The exposure pathways for the WRW that are expected to be both complete and have the possibility of contributing significantly to risk are:

- Inhalation of surface soil, sediments, and subsurface soil particulates;
- Ingestion of surface soil and subsurface soil/sediments;
- Dermal exposure to surface soil/sediments and subsurface soil; and
- External irradiation exposure from surface soil, sediments, and subsurface soil.

19

Complete but Insignificant Exposure Pathways for the Wildlife Refuge Worker

Best professional judgment has been used to designate exposure pathways that are considered complete, but are not anticipated to contribute significantly to Site risks to the WRW. This is generally due to a variety of factors that lead to low intakes. The rationale and justification for the classification of all exposure pathways will be included in the CRA Report. The following pathways are considered insignificant:

- Ingestion of surface water;
- Dermal exposure to surface water;
- Inhalation of volatiles from groundwater;
- Inhalation of volatiles from surface soil and subsurface soil; and
- External irradiation exposure from subsurface soil and building rubble.

Incomplete Exposure Pathways for the Wildlife Refuge Worker

Best professional judgment has been used to designate exposure pathways that are considered incomplete. Incomplete pathways imply that exposures are not anticipated and consequently will not contribute to Site risks to the WRW. The rationale and justification for the classification of all exposure pathways will be included in the CRA Report. The following pathways are considered incomplete:

- Ingestion of fish and/or deer/grazing animals from the Site;
- Ingestion of groundwater;
- Ingestion of homegrown produce; and
- Ingestion of building rubble.

2.2.2 Wildlife Refuge Visitor Exposure Scenario

The WRV scenario is based on the open space scenario used in the RSAL Report (EPA et al. 2002). The WRV includes both a child and adult who visit the Site 100 days/year for 2.5 hours/day, for a total of 250 hours/year. The remaining time is spent off site. Outdoor recreational activities will primarily be on and near established hiking trails. Hunting may be allowed on a very limited basis, possibly by lottery. It is assumed that this receptor may be exposed to residual contaminants. It is also assumed that the WRV will not conduct activities resulting in significant exposure to subsurface soil and surface water.

Complete Exposure Pathways for the Wildlife Refuge Visitor

Potentially complete exposure pathways from which exposures are expected for the WRV include:

- Ingestion of and dermal exposures to surface soil/sediments, subsurface soil, and surface water;
- Ingestion of deer and/or grazing animals;
- Inhalation of volatiles and particulates; and
- External exposure to beta and gamma radiation from radionuclides present in soil, subsurface soil, sediments, and building rubble.

20

Complete and Significant Exposure Pathways for the Wildlife Refuge Visitor

The exposure pathways for the WRV that are considered both complete and have the possibility of contributing significantly to risk are:

- Inhalation of surface soil/sediment particulates;
- Ingestion of surface soil/sediments;
- Dermal exposure to surface soil/sediments; and
- External irradiation exposure from surface soil/sediments.

Complete but Insignificant Exposure Pathways for the Wildlife Refuge Visitor

Best professional judgment has been used to designate exposure pathways that are considered complete, but are not anticipated to contribute significantly to Site risks to the WRV. An insignificant designation is generally due to a variety of factors that lead to low intakes. The rationale and justification for the classification of all exposure pathways will be included in the CRA Report. The following pathways are considered insignificant for the WRV:

- Ingestion of surface water;
- Dermal exposure to surface water;
- Ingestion of deer and/or grazing animals;
- Inhalation of outdoor air volatiles from surface water and groundwater;
- Inhalation of outdoor air volatiles from surface and subsurface soil;
- Inhalation of indoor air on Site; and
- External irradiation exposure from subsurface soil and building rubble.

Incomplete Exposure Pathways for the Wildlife Refuge Visitor

Best professional judgment has been used to designate exposure pathways that are considered incomplete. The rationale and justification for the classification of all exposure pathways will be included in the CRA Report. The following pathways are not anticipated to result in exposures, will not contribute to Site risks, and are considered incomplete for the WRV:

- Ingestion of groundwater; and
- Ingestion of building rubble.

21

3.0 DATA COLLECTION AND EVALUATION

Actions: Identify data needs and data sources, assemble data, and evaluate data quality and adequacy.

Data evaluation and aggregation will be performed on an EU, AEU, and Sitewide basis for the HHRA and ERA. The EUs are defined in Section 4.2 and the AEUs are defined in Section 7.0. The data evaluation and aggregation methods are described below. The DQO process specifies project decisions and techniques necessary to generate quality data and make associated conclusions (EPA 2000a). The DQO process will be used to:

- Define stated objectives;
- Define appropriate data collection methods;
- Establish necessary data types;
- Conduct data aggregation; and
- Specify acceptable levels of data quantity and quality necessary to support the risk assessment process.

Nature and extent data that have been collected historically at RFETS, and also progressively during RI/FS investigations and accelerated actions, will be identified and assembled. All environmental data for the Site are collected under agency-approved SAPs and standardized contract-required analytical procedures. Verification and Data Quality Assessment (DQA) procedures will be used to verify the quality and comparability of collected data. Accelerated actions are currently being conducted for specific areas of contamination based on comparison of data to human health action levels (ALs). An accelerated action evaluation for ecological receptors will be performed as part of the CRA process. Confirmation samples are collected following accelerated actions. Data that are no longer relevant due to accelerated actions will be designated and replaced with the confirmation sampling data in order to reflect the current concentrations following accelerated actions. COCs will be identified to support the comprehensive HHRA and ERA. Risks will be quantified, evaluated, and summarized for receptors by exposure scenarios and pathways for established EUs (as defined in Sections 4.2 and 7.0), and Sitewide (as defined in Section 7.0).

Site data will be used to evaluate residual contamination and determine contaminant distributions. Exposure parameters, such as inhalation and ingestion rate, exposure frequency, and exposure duration, have been determined for identified Site-specific receptors. Toxicity data will be collected to identify or derive dose limits to human and ecological receptors. Physical and chemical parameters for all viable COCs will also be collected, as necessary, to support a complete toxicity assessment, assessment of impacts to receptors, and determination of environmental fate and transport mechanisms, as required by the CRA. Radiological data for pertinent radionuclides, including plutonium-239, americium-241, uranium-235, and uranium-238, will be collected to determine Site-specific doses. Ecological data, such as historical ecological, biological, and habitat information that

22

have been collected for the Site, will be compiled and used to support assumptions for habitat usage, ecological exposures, and risk characterization for the ERA. The underlying principles for establishing the DQOs for the human health and ecological assessments are generally similar; however, Site use by humans versus ecological receptors and data needs differ. Therefore, the human health and ecological DQO processes are presented separately. DQOs specific to the ERA process are provided in Section 7.0.

3.1 Human Health Risk Assessment Data Quality Objectives

The CRA follows the EPA DQO process to ensure that the type, quantity, and quality of environmental data used in decision making are appropriate for the intended purpose (EPA 2000a). The DQO process consists of seven steps that specify project decisions, the data quality required to support those decisions, specific data types needed, data collection requirements, and analytical techniques necessary to generate the specified data quality. During the first six steps of the DQO process, the planning team develops decision performance criteria (that is, DQOs) for the data collection design. All decision rules need to be considered, as appropriate. The final step of the process involves developing the data collection design based on the DQOs.

3.1.1 Step 1: State the Problem

Risks from exposure to residual contaminants present in environmental media at RFETS must be quantified to determine whether endstate long-term land use is protective and within the range of acceptable risk. The nature and extent of COCs must be adequately determined to quantify human health and ecological risks at RFETS. Sufficient data must be available to the risk assessor to define the EPC, which is an estimate of the long-term concentration to which a receptor is exposed. The EPC incorporates the spatial and temporal variability of contaminant concentrations, and reflects the random and long-term access of the receptor to the exposure area.

The problem is:

> *"The long-term average exposure of human receptors to contaminants in all media in an EU must be estimated for the CRA."*

3.1.2 Step 2: Identify the Decision

The primary decision is:

> *"Are risks to receptors at RFETS following exposure to residual contamination acceptable based on the reasonably anticipated future land use?"*

Resolution and documentation of the following key secondary decisions will be required to ensure completion of the CRA. Each of these is discussed in the following sections of this document.

- Has a methodology been developed to adequately assess human health risks?
- Has a methodology been developed to adequately identify COCs?
- Is the CRA SCM adequate to define all viable exposure scenarios, exposure pathways, and receptors based on the reasonably anticipated future land use?

23

- Have all EUs been adequately defined and established?
- Have the nature and extent of inorganic, organic, and radionuclide analytes within EUs been identified with adequate confidence, based on evaluation of Site process knowledge and analytical data?
- Have sufficient samples been collected to adequately estimate the long-term average exposure of receptors to contaminants in all media in an EU?

3.1.3 Step 3: Identify the Inputs to the Decision

Available Site historical information, sampling data, and the CRA Methodology and requirements will be used to determine adequate sampling locations and densities for EUs.

The CRA DQA methodology (Section 3.1.5) will be applied to all data used in the CRA. The DQA procedures generally follow the federal guidelines in EPA's Guidance for Data Usability in Risk Assessment, Parts A and B (EPA 1992a, 1992b). Data will be screened through the COC selection process as described in Section 4.4. All data will also be screened using professional judgment to ensure they meet risk assessment needs. The rationale and justification will be documented in the CRA Report. All selected COCs will be used to calculate risks to receptors.

3.1.4 Step 4: Define the Study Boundaries

Study boundaries are used to define the spatial and temporal boundaries for data collection in support of the decision to quantify risk to receptors. Environmental media analyte data will be assessed for surface soil and sediments to a depth of 6 inches, and for subsurface soil from 6 inches to 8 feet. Existing environmental media data will be used when possible and additional sampling will be conducted if determined to be necessary. Sufficient samples will be collected to statistically evaluate the data, identify COCs, and quantify risk to receptors. These results will be used in the CRA.

The assessment will be confined to the area within the RFETS boundary unless the on-site assessment indicates circumstances that could alter the conclusions of the assessment performed earlier for OU 3, Offsite Areas (DOE 1996a).

Functional EUs for the WRW and WRV receptors have been established based on watersheds, known patterns of contamination, and expected activity patterns. Known Individual Hazardous Substance Sites (IHSSs), Potential Areas of Concern (PACs), and Under Building Contamination (UBC) Sites of special interest will be included in the EU assessments. Analyte data will be aggregated at the EU level to quantify risk to human receptors.

Statistical evaluation of environmental data may include standard descriptive calculations; precision, accuracy, representativness, completeness, and comparability (PARCC) parameter analyses; distribution testing; population testing of Site data relative to background; nonparametric tests; and probabilistic resampling techniques, such as Bootstrapping and power calculations.

24

3.1.5 Step 5: Identify the Data Adequacy Decision Rules

This section presents the decision rules to determine data adequacy for both the human health and ecological risk assessment portions of the CRA. The nature and extent of organics, inorganics, and radionuclides must be determined with sufficient certainty to permit adequate quantification of statistically determined EPCs, and quantification of risk to receptors. Sufficient samples must be collected to adequately estimate the long-term average exposure of receptors to contaminants in all media in an EU. Adequate characterization will ensure that EPCs are representative of the areas to be assessed. The placement of samples Sitewide will be assessed to ensure that sources of contamination are well characterized and that the adequacy of the EPCs can be determined. Data adequacy criteria must, therefore, be met or additional sampling and analysis will have to be performed.

Data Adequacy Assessment

The following decision rules will be used to determine whether analyte data are adequate to support statistical, exposure, and risk calculations for the CRA.

- If one or more metal and radionuclide surface soil sample is available per 30-acre block outside of source areas, data will be considered sufficient. If not, one composite sample will be collected in each 30-acre area, as described in the Buffer Zone Sampling Addendum (DOE 2004).
- Data adequacy for all other analyte groups and media will be determined through the consultative process with the agencies. All decision criteria, sampling decisions, and supporting data will be included in the data adequacy report (DAR) for the CRA. Final sampling locations will be determined through the consultative process with the regulatory agencies.

PARCC Parameter Assessment

Data quality and adequacy will also be assessed using a standard PARCC parameter analysis (EPA 2000b) for all data in each environmental media as described below.

Precision

For nonradiological contaminants, if the relative percent difference (RPD) between the target and duplicate, at concentrations five times the reporting limit (RL), is less than 35 percent for solids and 20 percent for liquids, the overall precision of the contaminant concentration is adequate. Otherwise, the magnitude of the imprecision must be addressed in the CRA and/or additional samples may be required (EPA 2000b).

For radiological contaminants, if the duplicate error ratio (DER) is less than 1.96, the overall precision of the contaminant concentration is adequate. Otherwise, the magnitude of the imprecision must be addressed in the CRA and/or additional samples may be required (EPA 2000b).

25

Accuracy

If overall accuracy for the SW-846 (EPA 1994) and alpha-spectroscopy methods comply with the National Basic Ordering Agreement (BOA) Implementation Requirements (K-H 2003), as verified through formal verification and validation (V&V) (EPA 2000b) of the results, then the results may be used in the CRA without qualification. Otherwise, the magnitude of the inaccuracy(s) must be addressed in the CRA and/or additional samples may be required.

Representativeness

Prerequisites to the decision criteria include an adequate number of valid sample results as stipulated in the Completeness section, and sample acquisition and analysis under an approved Quality Program as follows:

- If sampling locations are spatially distributed such that contaminant randomness and bias considerations are addressed, based on the site-specific history, then sample results are representative. Otherwise, the results must be qualified and/or additional samples collected.
- If samples were analyzed by the SW-846 or alpha-spectroscopy methods and results were documented accordingly, as quality records according to approved procedures and guidelines, the sample results are representative of contaminant concentrations. Otherwise, results of the CRA must be qualified and/or additional samples collected.

Completeness

Completeness will be evaluated using the following determination:

- If at least one sample for metals and radionuclides exists in each 30-acre block across the Site, the sampling is adequate.
- If samples were collected to spatially define the distribution of an analyte in an EU, the number of samples is adequate. Otherwise, additional samples may be collected.

Comparability

Sample collection and analysis methods will be reviewed for comparability. Similarities and differences between the sample collection and analysis methods will be documented. Decisions on comparability will be made in consultation with the regulatory agencies. If chemical and radiological results are comparable within the aggregated CRA data set based on defined matrices and standardized units of measure (for example, picocuries per gram [pCi/g] and milligrams per kilogram [mg/kg]), the data are adequate for use in the CRA. Otherwise, the results must be converted or normalized, the CRA qualified, and/or additional samples collected (EPA 2000b).

3.1.6 Step 6: Specify Tolerable Limits on Decision Errors

Sources of uncertainties in the risk assessments will be identified, minimized, and documented in the CRA. This may include use of upper-bound numbers or ranges of values,

26

as applicable, for various parameters considered; concentration term estimates; contaminant transport; data distribution assumptions; and EU use assumptions.

Where alpha and beta errors are applicable in statistical hypothesis testing, these errors will also be documented. Alpha error will not exceed 10 percent in sample power calculations, whereas beta error will not exceed 20 percent in sample power calculations.

3.1.7 Step 7: Optimize the Design

Based on the iterative nature of the DQO process, any decision that is not consistent with project goals will result in a reinitiation of the DQO process. If determination of the nature and extent of analytes is found to be inadequate, further sampling will be initiated. If sampling power is determined to be inadequate for any given scenario and set of analyte data, more samples will be collected and the sampling power will be recalculated.

4.0 HUMAN HEALTH EXPOSURE ASSESSMENT

> **Actions:** Identify potential land use and exposed populations; develop the SCM, exposure factors for each pathway, and EUs for data aggregation; identify COCs; determine whether transport modeling is necessary; estimate COC EPCs; and quantify intake to receptors.

The CRA human health exposure assessment will quantitatively and qualitatively evaluate contact between human receptors and COCs. The exposure assessment will estimate the total dose or intake for a receptor in an EU for a particular land use and exposure scenario. The calculated dose is then combined with chemical-specific dose-response data to estimate risk (EPA 1992c). The exposure assessment methods for the HHRA are described in detail in the following sections.

4.1 Exposure Factors

This section presents the exposure factors for the HHRA.

4.1.1 Exposure Pathway Assessment

Exposure pathways (that is, the courses a contaminant takes from the source to a receptor) are shown in the SCM (Figure 2.1). In the model, exposure pathways are designated as incomplete (IC), complete and significant (S), or complete and insignificant (I) as defined previously.

Direct contact with surface soil, subsurface soil (to 8 feet in depth), and sediments; the inhalation of airborne contaminants; and exposure to penetrating radiation are the primary exposure pathways of concern. Contact with subsurface soil is considered for the WRW, but is limited both spatially and temporally (Section 4.5). Ingestion of and dermal contact with surface water and volatilization of contaminants are considered insignificant pathways. Ingestion of or dermal contact with groundwater are considered incomplete and will not be assessed. Ingestion of or dermal contact with groundwater that daylights at seeps or streams

27

are considered to be insignificant pathways. Ingestion of animal tissue is incomplete for the WRW, but is considered complete but insignificant for the WRV due to the fact that hunting, if any, will be limited. All other exposure pathways are considered incomplete and will not be addressed, including ingestion of groundwater and/or fish.

Inhalation Pathway

The inhalation pathway will be assessed for resuspension of airborne contaminants present in surface soil transported to human and ecological receptors. The receptors will be assessed for this exposure pathway using the contaminant concentration in the soil and the mass loading variable developed for the RSALs (EPA et al. 2002). Increased resuspension and exposures due to fires are also accounted for the WRW and WRV in the mass loading factor as calculated by the RSALs Workgroup. The potential volatilization of contaminants from soil and shallow groundwater to receptor locations is considered an insignificant pathway. Volatilization into office space will be evaluated for WRW offices outside the ICA.

Ingestion Pathway

The ingestion pathway will be assessed for direct ingestion of contaminants present in surface soil and sediments and the WRW and WRV receptors. Direct ingestion of surface water will be assessed for the WRW, but not the WRV receptor. Exposure to contaminants in groundwater in the upper hydrostratigraphic unit (UHSU) transported to surface water is currently considered complete, but insignificant. An assessment will be performed on surface water data and results of modeling the transport of groundwater contaminants to surface water and reported in the CRA.

Runoff from contaminated soil to nearby surface water could also result in direct ingestion of contaminated surface water and contribute to possible contamination of aquatic species. However, direct ingestion of contaminated fish collected from the area is considered an insignificant and incomplete pathway, and will not be assessed. Ingestion of deep aquifer (LHSU) groundwater will not be assessed as a viable exposure pathway. Collection of meat from hunting activities and subsequent ingestion is also considered insignificant and will not be assessed.

Dermal Exposure Pathway

Dermal exposure due to contact with contaminated soil and sediments will be assessed for the WRW and WRV receptors. Dermal exposure to surface water will not be assessed for either receptor.

External Irradiation Exposure Pathway

External irradiation exposure will be assessed for both receptors to determine impacts to human receptors resulting from exposure to external penetrating radiation emanating from radionuclides present in contaminated environmental media.

4.1.2 Wildlife Refuge Worker Scenario Exposure Factors

The exposure factors for the WRW are presented in Table 4.1. Factors were taken from the RSALs Task 3 Report (EPA et al. 2002) where available. Dermal exposures were not included in the RSALs. The sediment and subsurface pathways also were not assessed in the RSALs Report.

Table 4.1 CRA Exposure Factors for the On-Site WRW Receptor

Exposure Factor	Abbreviation	Unit	Value	Source
Chemical concentration in medium	Cs	mg/kg or pCi/g	chemical-specific	
Adult body weight	Bwa	kg	70	EPA 1991
Surface soil/sediment exposure frequency	Efwss	day/yr	230	EPA et al. 2002
Surface-subsurface soil/sediment exposure frequency	Efwsub	day/yr	20	DOE 2003a
Exposure duration	Edw	yr	18.7	EPA et al. 2002
Exposure time	Etw	hr/day	8	EPA et al. 2002
Exposure time fraction, outdoor	Eto_w	--	0.5	EPA et al. 2002
Exposure time fraction, indoor	Eti_w	--	0.5	EPA et al. 2002
Averaging time – noncarcinogenic	Atnc	day	6,826	Calculated
Averaging time – carcinogenic	Atc	day	25,550	Calculated
Soil/sediment ingestion rate	Irwss	mg/day	100	EPA et al. 2002
Skin-soil adherence factor	Afw	mg/cm^2-event	0.117[a]	EPA 2001b
Event frequency	Evw	events/day	1	EPA 2001b
Skin surface area (exposed)	Saw	cm^2	3,300[b]	EPA 2001b
Soil dermal absorption fraction	ABS	--	chemical-specific	EPA 2001b
Inhalation rate	Iraw	m^3/hr	1.3	EPA et al. 2002
Dilution factor, indoor inhalation	Dfi	--	0.7	EPA et al. 2002
Mass loading, (PM10) for inhalation	MLF	kg/m^3	6.7E-08[c]	EPA et al. 2002
Area correction factor	ACF	--	0.9	EPA et al. 2002
Gamma shielding factor (1-Se) outdoor	GSFo	--	1	EPA et al. 2002
Gamma shielding factor (1-Se)	GSFi	--	0.4	EPA et al. 2002
Gamma exposure factor (annual) surface soil = (Efwss / 365 day/yr)	Te_A	--	0.63	Calculated
Gamma exposure factor (annual) subsurface soil = (Efwsub / 365 day/yr)	Te_As	--	0.05	Calculated
Gamma exposure factor (daily) outdoor = (Etw x Eto_w hr/day / 24 hr/day)	Te_Do	--	0.167	Calculated
Gamma exposure factor (daily) indoor = (4 hr/day / 24 hr/day)	Te_Di	--	0.167	Calculated
Conversion factor 1	CF1	kg/mg	0.000001	
Conversion factor 2	CF2	g/kg	1,000	
Conversion factor 3	CF3	g/mg	0.001	

a. The skin soil adherence factor is the geometric mean for farmers. This value is recommended by CDPHE for use in the WRW PRGs.

b. The skin surface area value is the EPA default for commercial/industrial exposures and is the average of the 50^{th} percentile for men and women >18 years old wearing a short-sleeved shirt, long pants, and shoes. The value was recommended by CDPHE for use in the WRW PRGs.

c. The mass loading value is the 95^{th} percentile of the estimated mass loading distribution estimated in the RSALs Task 3 Report (EPA et al. 2002).

29

4.1.3 Wildlife Refuge Visitor Scenario Exposure Factors

Current plans for the wildlife refuge include public uses similar to open space usage previously developed for RFETS, with trails for wildlife observation, hiking, and biking (USFWS 2004). The exposure time and duration factors for the WRV receptor, presented in Table 4.2, are based on a survey conducted by Jefferson County of open space users (Jefferson County 1996). The values were first used in the open space PRG calculations for the Site and were adapted for the RSALs Report.

Table 4.2 CRA Exposure Factors for the WRV Receptor

Exposure Factor	Abbreviation	Unit	Value	Source
Concentration in medium	Cs	mg/kg or pCi/g	chemical-specific	
Adult body weight	Bwa	kg	70	EPA 1991
Child body weight	BWc	kg	15	EPA 1991
Exposure frequency	Efv	day/yr	100	EPA et al. 2002[a]
Exposure duration-adult	Edav	yr	24	EPA 1991
Exposure duration-child	Edcv	yr	6	EPA 1991
Exposure duration-total	Edt	yr	30	EPA 1991
Exposure time	Etv	hr/day	2.5	EPA et al. 2002[b]
Adult averaging time – noncarcinogenic	Atancv	day	8,760	Calculated
Child averaging time – noncarcinogenic	Atcncv	day	2,190	Calculated
Total averaging time – noncarcinogenic	Atnc	day	10,950	Calculated
Averaging time – carcinogenic	Atc	day	25,550	EPA 1991
Adult soil ingestion rate	SIRav	mg/day	50	EPA et al. 2002
Child soil ingestion rate	SIRcv	mg/day	100	EPA et al. 2002
Age-adjusted soil ingestion rate for non-radionuclides	SIRageav	mg-yr/kg-day	57	Calculated
Age-adjusted soil ingestion rate for radionuclides	SIRagav_r	mg/day	60	Calculated
Adult skin-soil adherence factor	Afav	mg/cm^2-event	0.07[c]	EPA 2001b
Child skin-soil adherence factor	Afcv	mg/cm^2-event	0.2[d]	EPA 2001b
Event frequency	Evv	events/day	1	EPA 2001b
Adult skin-surface area (exposed)	Saav	cm^2	5700[e]	EPA 2001b
Child skin-surface area (exposed)	Sacv	cm^2	2800[f]	EPA 2001b
Age-averaged surface area/adherence factor	SFSagav	mg-yr/kg-event	361	EPA 2001b
Dermal absorption fraction	ABS	--	chemical-specific	EPA 2001b
Outdoor inhalation rate – adult	Irov	m^3/hr	2.4	EPA et al. 2002
Outdoor inhalation rate – child	Ircov	m^3/hr	1.6	EPA et al. 2002
Age-averaged inhalation factor (non-radionuclides)	Iragav	m^3-yr/kg-day	3.7	EPA et al. 2002
Age-averaged inhalation rate (radionuclides)	Iragav_r	m^3/hr	2.2	EPA et al. 2002
Mass loading, (PM10) for inhalation	MLF	kg/m^3	6.7 E-08[g]	EPA et al. 2002
Area correction factor	ACF	--	0.9	EPA et al. 2002
Gamma shielding factor (1-Se) outdoor	GSFo	--	1	EPA et al. 2002
Gamma exposure factor (annual) = (Efv / 365 day/yr)	Te_Av	--	0.3	Calculated
Gamma exposure factor (daily) = (Etv	Te_Dv	--	0.1	Calculated

30

Exposure Factor	Abbreviation	Unit	Value	Source
hr/day / 24 hr/day)				
Conversion factor 1	CF1	kg/mg	0.000001	
Conversion factor 2	CF2	g/kg	1,000	
Conversion factor 3	CF3	g/mg	0.001	

a. Value is the 95th percentile of visitation frequency for open space users (Jefferson County 1996).
b. Value is the 50th percentile of time spent for open space users (Jefferson County 1996).
c. The adult skin-soil adherence factor is the EPA residential default and the 50th percentile for gardeners. This is the value recommended by CDPHE for use in the WRW PRGs.
d. The child skin-soil adherence factor is the EPA residential default and the 95th percentile for children playing in wet soil. This is the value recommended by CDPHE for use in the open space user PRGs.
e. The adult skin-surface area value is the EPA default for residential exposures and the average of the 50th percentile for males and females >18 years old wearing short-sleeved shirts, shorts, and shoes. The value was recommended by CDPHE for use in the WRW PRGs.
f. The child skin-surface area value is the EPA default for residential exposures and the average of the 50th percentile for males and females from <1 to <6 years old wearing short-sleeved shirts, shorts, and no shoes. The value was recommended by CDPHE for use in the WRW PRGs.
g. The mass loading value is the 95th percentile of the estimated mass loading distribution estimated in the RSALs Task 3 Report (EPA et al. 2002).

4.2 Functional Exposure Units

Risk assessments evaluate the long-term threats to human health and the environment. An EU is the area over which long-term risks to the chosen receptors are assessed. The EU is an embodiment of the exposure scenario and its size varies with the land use and receptor activities. Recreational or open space EUs are generally large, depend on the recreational activities envisioned for the site, and represent the area over which a receptor ranges during recreational activities. The activities of a WRW are even more extensive and varied, and the area over which the worker will be exposed during a career is quite large.

4.2.1 Exposure Unit Development

Human health risks and health hazards will be assessed in two ways at RFETS:

1. An on-site WRW will be assessed based on exposure to COCs selected for each EU.
2. An on-site WRV will be assessed based on exposure to COCs selected for each EU. The same EUs will be used for the WRV as for the WRW assessment.

The EUs for the WRW and WRV are illustrated on Figure 4.1a. AEUs were developed for the ERA. The AEUs are presented on Figure 4.1b and described in Section 7.0. As stated above, sources of contamination will be determined using Site data to assess the spatial and temporal distribution of all classes of contaminants. This information will be used to support the selection of COCs. Primary areas of contamination will be identified and depicted on Site maps. Data sufficiency will be assessed.

The RFETS EUs integrate the above factors and also:

- Consider Site contaminant release patterns and distinct areas of contamination;
- Aggregate data on a watershed basis;
- Support future land use planning;

31

- Facilitate assessment of risk in functional areas; and
- Comply with RFCA/CERCLA requirements.

The RFETS EUs represent long-term activity areas in which the WRW and WRV will be exposed to residual contamination. The importance and relationship of the above items to long-term risks are discussed below.

Contaminant Release Patterns

Contaminant release patterns and known sources were incorporated in the delineation of the RFETS EUs, as shown on Figures 4.2 and 4.3. The objective is to assess areas with similar types of contamination on a collective basis. For example:

- The IA EU has the most IHSSs, PACs, and UBC Sites and was the area most affected by industrial activities at the Site.
- The Wind Blown Area EU includes surface soil affected by the 903 Pad release that is characterized by elevated plutonium and americium activities.
- The Upper Walnut Drainage EU includes the A- and B-Series ponds, which have elevated levels of radionuclides in sediments.
- The No Name Gulch Drainage EU encompasses the Present Landfill and downgradient areas.
- The Lower Walnut Drainage EU stream sediments are affected by surface water flows from the ponds and erosion from the Wind Blown Area.
- The Woman Drainage EU is affected by the 903 Pad, the Original Landfill, and other IHSSs and PACs.
- The remaining four EUs are not significantly affected by releases from the Site.

Watersheds

The EUs were designed on a watershed basis. This was done to account for similar long-term fate and transport processes for residual contaminants in soil and sediments. The major surface transport process for persistent contaminants in surface soil is overland flow and transport of eroded soil in surface water. The EUs represent distinct areas affected by the potential transport of residual contamination from well-defined sources and activity areas for the WRW and WRV receptors based on similar landscapes and habitats.

Future Land Use Planning

The EUs were designed to support future land use planning by assessing risks for areas aggregated by similar geography, ecology, and expected usage. This will enable planners and managers to use the results of the CRA to determine areas of the Site to target for more intensive recreational development or other uses, such as ranger offices or a visitor center for the refuge.

32

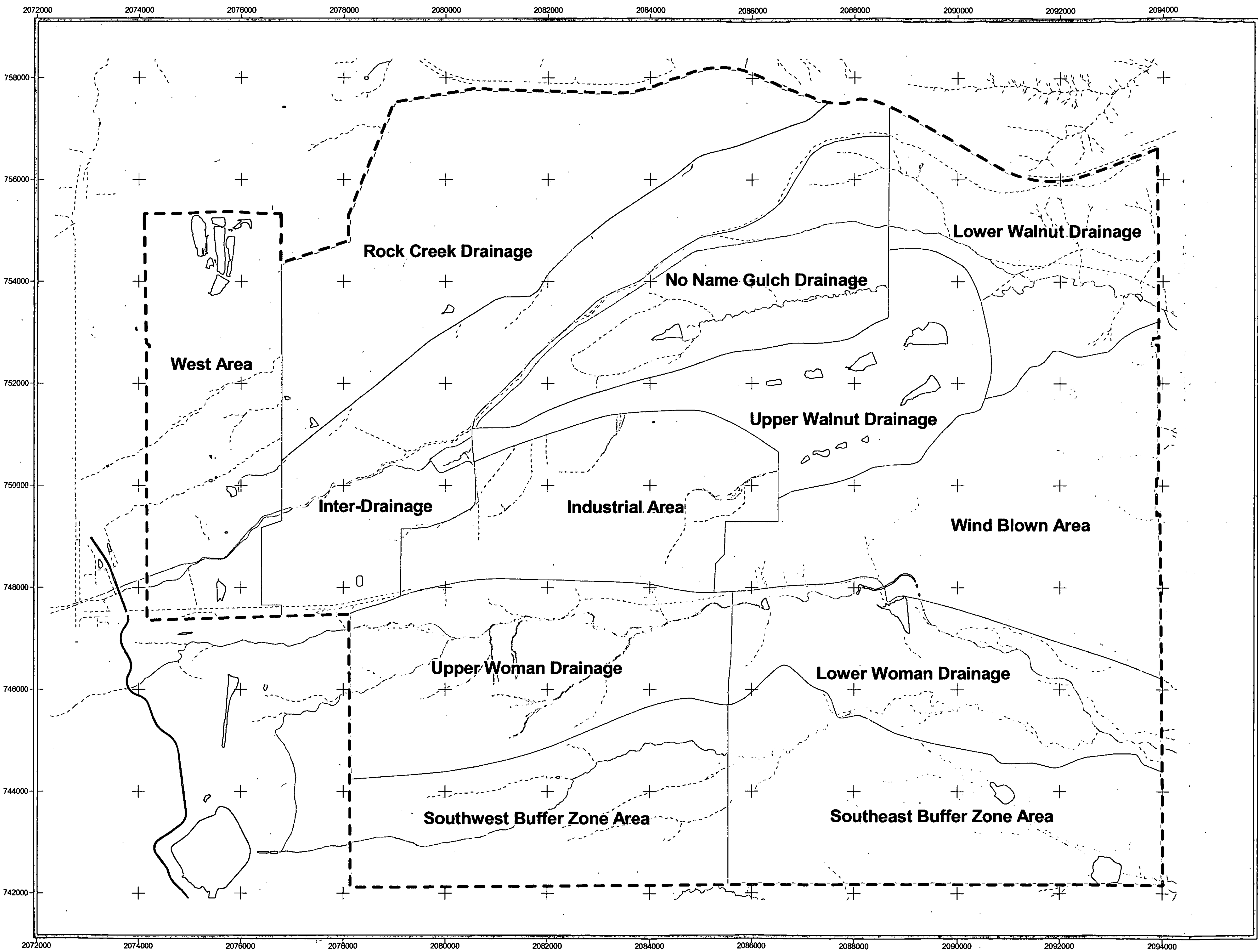


Figure 4.1a

Human Health Exposure Units

Standard Map Features

- Exposure unit boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N E S W

0 1000 2000 Feet

Scale 1:24000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared for: KAISER•HILL COMPANY

Date: 9/30/05

File: W:\Projects\Fy2005\CRA\GIS_Final\ArcView\Methodology\Methodology.apr

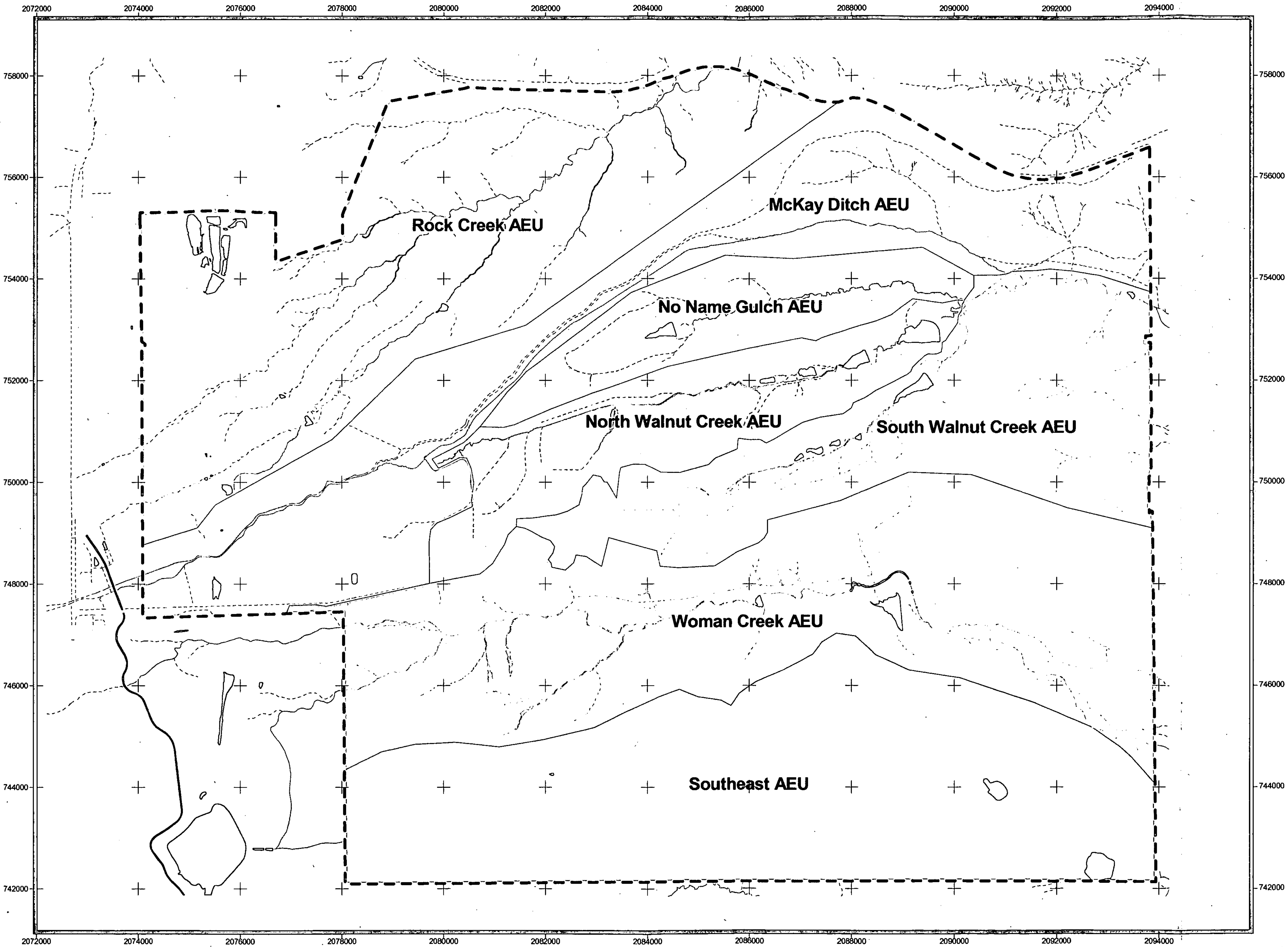


Figure 4.1b

Aquatic Exposure Units

Standard Map Features

- Aquatic exposure unit boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N
W E
S

0 1000 2000 Feet

Scale 1:24000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared for: Date: 9/30/05

KAISER•HILL COMPANY

File: W:\Projects\Fy2005\CRA\GIS_Final\ArcView\Methodology\Methodology.apr

34

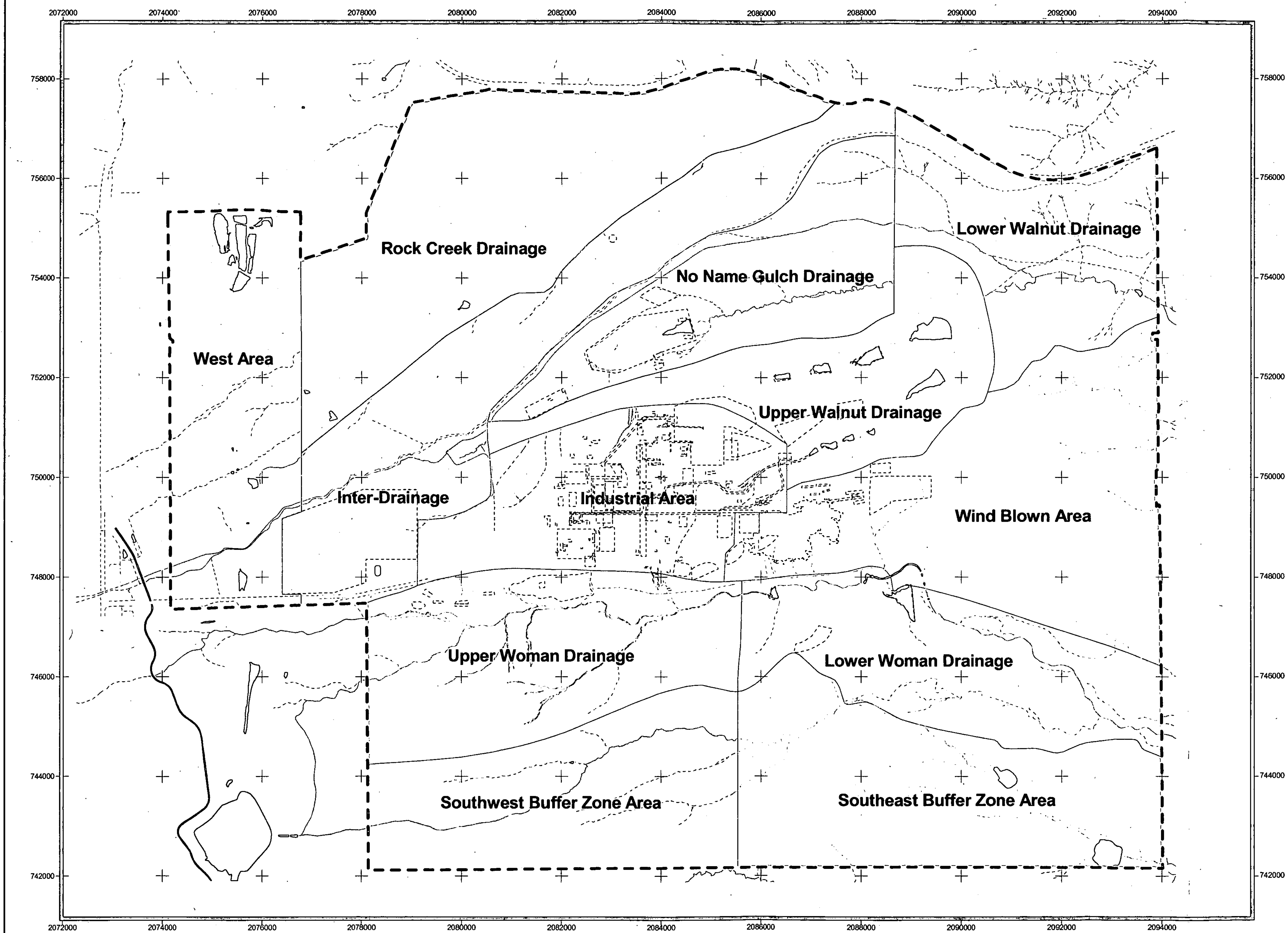


Figure 4.2

Exposure Units with IHSSs

KEY

IHSS

Standard Map Features

- Exposure unit boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

0 1000 2000 Feet

Scale 1:24000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared for: KAISER•HILL COMPANY

Date: 9/30/05

File: W:\Projects\Fy2005\CRA\GIS_Final\ArcView\Methodology\Methodology.apr

35

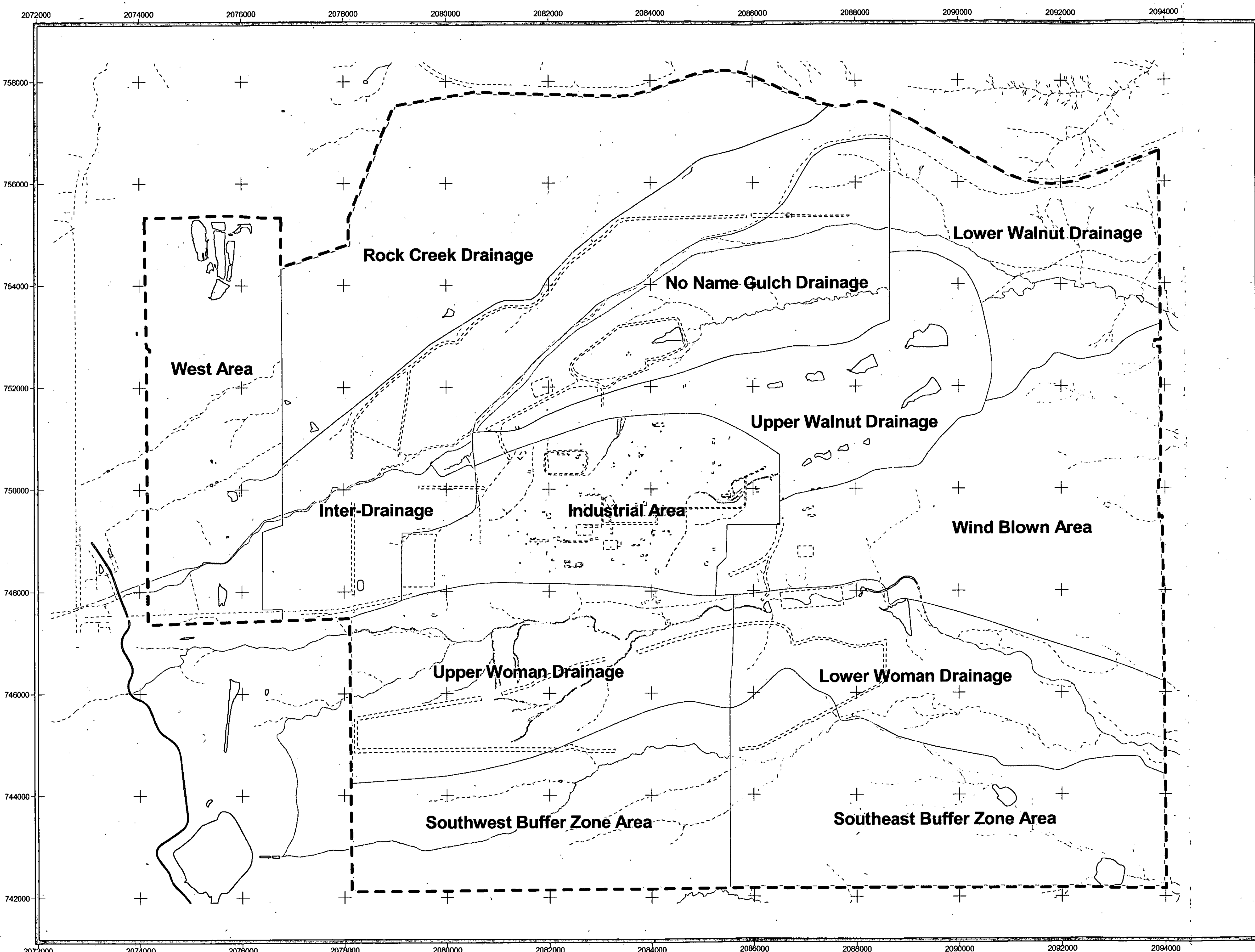


Figure 4.3

Exposure Units with PACs

KEY

PAC

Standard Map Features

- Exposure unit boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N W E S

0 1000 2000 Feet

Scale 1:24000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared for: Date: 9/30/05

KAISER•HILL COMPANY

File: W:\Projects\Fy2005\CRA\GIS_Final\ArcView\Methodology\Methodology.apr

36

Assessment of Functional Areas

The EUs are representative of functional areas of expected activity for the WRW or WRV receptors. The areas of the EUs vary from 390 to 735 acres, as shown in Table 4.3. Time-weighted functional activity areas for refuge personnel were calculated using survey data collected for the Rocky Mountain Arsenal (RMA) risk assessment (Table 4.4). The areas were calculated using the estimated time spent in each area size class, using the following formula:

$$\textit{Time-Weighted Area} = \sum_{i=1\ to\ 3} (t_i/t_t * A_i) \qquad \text{(Equation 4-1)}$$

Where:

t_i = the time spent in the ith area size class by workers

t_t = the total time spent in all area size classes by workers

A_i = the ith area (midpoint or maximum of size range)

As the comparison of Tables 4.3 with 4.4 shows, the resulting time-weighted functional activity areas for WRW, in general, are in the same size range as those designated for RFETS. The designated EUs (Figure 4.1) are also indicative of different functional areas. Activities performed in the drainages will vary from those performed in the upland areas due to variation in topography, vegetation, and habitat. The assessment of risks in the EUs will result in a complete assessment of the risks from residual contamination at the Site.

Table 4.3 RFETS EU Areas

EU	Area (acres)
Industrial Area	428
Upper Woman Drainage	524
Lower Woman Drainage	448
Southwest Buffer Zone Area	476
Southeast Buffer Zone Area	579
Wind Blown Area	715
Upper Walnut Drainage	403
Lower Walnut Drainage	390
No Name Gulch Drainage	425
Inter-Drainage	596
Rock Creek Drainage	735
West Area	468

37

Table 4.4 Time-Weighted Average Activity Areas for WRWs

Time-Weighted Average Activity Areas for Refuge Workers[a]		**Small Areas 0-10 (Acres)**	**Medium Areas 10-500 (Acres)**	**Large Areas 500-6000 (Acres)**	**Total Time-Weighted EU Size (Acres)**
	Midpoint Size of Area	5	255	3,251	**3,511**
	Max Size of Area	10	500	6,000	**6,510**
All Workers	Midpoint Time-Weighted Area	2	126	332	**460**
	Max Time-Weighted Area	4	248	613	**865**
Workers Spending > 50% Time Outdoors	Midpoint Time-Weighted Area	1.9	132	319	**453**
	Max Time-Weighted Area	3.8	260	589	**852**
Workers Spending > 30% Time Outdoors On Site 100% of Time	Midpoint Time-Weighted Area	2	133	425	**560**
	Max Time-Weighted Area	3	261	784	**1048**
All Workers Spending >30% Time Outdoors	Midpoint Time-Weighted Area	1.8	132	421	**555**
	Max Time-Weighted Area	3.5	260	777	**1,040**

a. Calculated from original survey data from: Table B.2-14 (RMA IEA/RC Appendix B, 8/93) (reported times at middle and higher activities, outdoors) and from Table B.2 att 2-1,2,3,4,5,& 6 (RMA IEA/RC Appendix B, 2/15/94) (reported times doing specific tasks).
Survey was performed by Shell for the Army's Baseline Risk Assessment for the RMA. WRWs from Malheur, Oregon (M), Minnesota Valley, MN (MV) and Crab Orchard, IL (CO) WRWs were included in the survey.
Carl Spreng and Diane Niedzwiecki of CDPHE then exercised professional judgment to decide land area for each task.

Compliance with RFCA/CERCLA Requirements

Under CERCLA, it must be shown that risks for expected land uses at the Site fall within the acceptable range of 1×10^{-6} to 1×10^{-4} cancer risks and below a hazard index (HI) of 1 for noncarcinogenic effects. The assessments for the EUs will present a comprehensive evaluation of long-term risks to the designated receptors across the Site. These results will provide estimates of residual risks from the Site following accelerated actions.

4.2.2 Exposure Units for the Wildlife Refuge Worker

As discussed above, EUs for the WRW, shown on Figure 4.1, incorporate information on contaminant releases and watershed and drainage features, and are based on anticipated activity patterns. These EUs form the basis for the assessment of risks to the anticipated major receptor in the CRA, recognize distinct areas of contamination, and support land use planning.

38

The assessments for the EUs represent the risks a worker will encounter in discharging his or her duties across the Site. The nature of the work involves movement over the entire Site. Therefore, relatively small EUs do not represent true estimates of long-term risks to the worker. However, due to the nature of the distribution of residual contamination across the Site, some areas represent a greater risk to the worker. The EU assessments address this concern by representing functional areas in which the WRW will randomly contact the areas of greater risk. The EU assessments will provide a realistic evaluation of long-term risks at the Site.

The HHRA flow for each EU is given below. The flow for the ERA is provided in Section 7.0.

1. The areas of the EUs are set forth in this Methodology.
2. All surface soil, sediment, subsurface soil, and surface water sampling locations will be included for each EU for the WRW scenario.
3. A DQA will be performed on the samples in each EU to ensure that the data within each are of sufficient quantity and quality to perform a risk assessment.
4. The COC selection process will be applied to surface soil, sediments, and subsurface soil to a depth of 8 feet, the estimated depth of potential disturbance.
5. Soil below 8 feet in depth will be qualitatively evaluated.
6. Data will be aggregated by EU and risks will be characterized.

4.2.3 Exposure Units for the Wildlife Refuge Visitor

The refuge visitor is envisioned as participating in a variety of activities at the wildlife refuge. The visitor may be under the guidance and oversight of a WRW. Therefore, the same EUs will be applied to assess risks to the WRV as for the WRW.

The risk assessment flow for each WRV EU is given below:

1. The EUs are set forth in this Methodology.
2. All surface soil and sediment sampling locations in each EU will be included for the WRV scenario.
3. Surface soil and sediments will be combined for the COC selection process.
4. A DQA will be performed on the samples in each EU to ensure that the data within each are of sufficient quantity and quality to perform a risk assessment.
5. Data will be aggregated by EU and risks will be characterized.

4.3 Data Aggregation for Risk Assessment

Analytical results from sampling and contaminant concentrations estimated from transport modeling that meet the DQO and DQA requirements will be used to estimate human health risks on an EU basis (Section 4.2). The types of data aggregation to be performed for the HHRA are outlined in Table 4.5. Data for surface soil, subsurface soil, and sediments will be

39

aggregated on an EU basis to estimate exposure concentrations and intakes to perform the CRA.

Table 4.5 Data Aggregation for the CRA

Exposure Scenario	Media	Data Aggregated by EU?
WRW	Surface Soil and Sediment	Yes
	Subsurface Soil	Yes
WRV	Surface Soil and Sediment	Yes
	Subsurface Soil	No

4.4 Human Health Contaminant of Concern Identification and Selection

COCs will be selected for each media and identified on an EU basis. The COC selection process is specific to the CRA and differs somewhat from that used in the determination of accelerated actions due to human health concerns. COCs will be determined for each individual EU because historical use of chemicals varied across the Site. The COC lists will be developed using the WRW PRGs developed for the CRA (Appendix A). Screening-level PRGs have been developed specifically for the CRA for WRW exposure to surface soil, subsurface soil, inhalation of volatiles in indoor air, and ingestion of surface water. The screening-level PRGs are documented in Appendix A. The WRW COCs will also be used for the WRV scenario.

4.4.1 Selection of Human Health Contaminants of Concern

The selection of COCs will follow the process outlined on Figure 4.4. The process will be applied to each EU. Environmental media that will be included in the COC selection process are surface soil, sediments, subsurface soil, surface water, and groundwater.

4.4.2 Data Quality Assessment

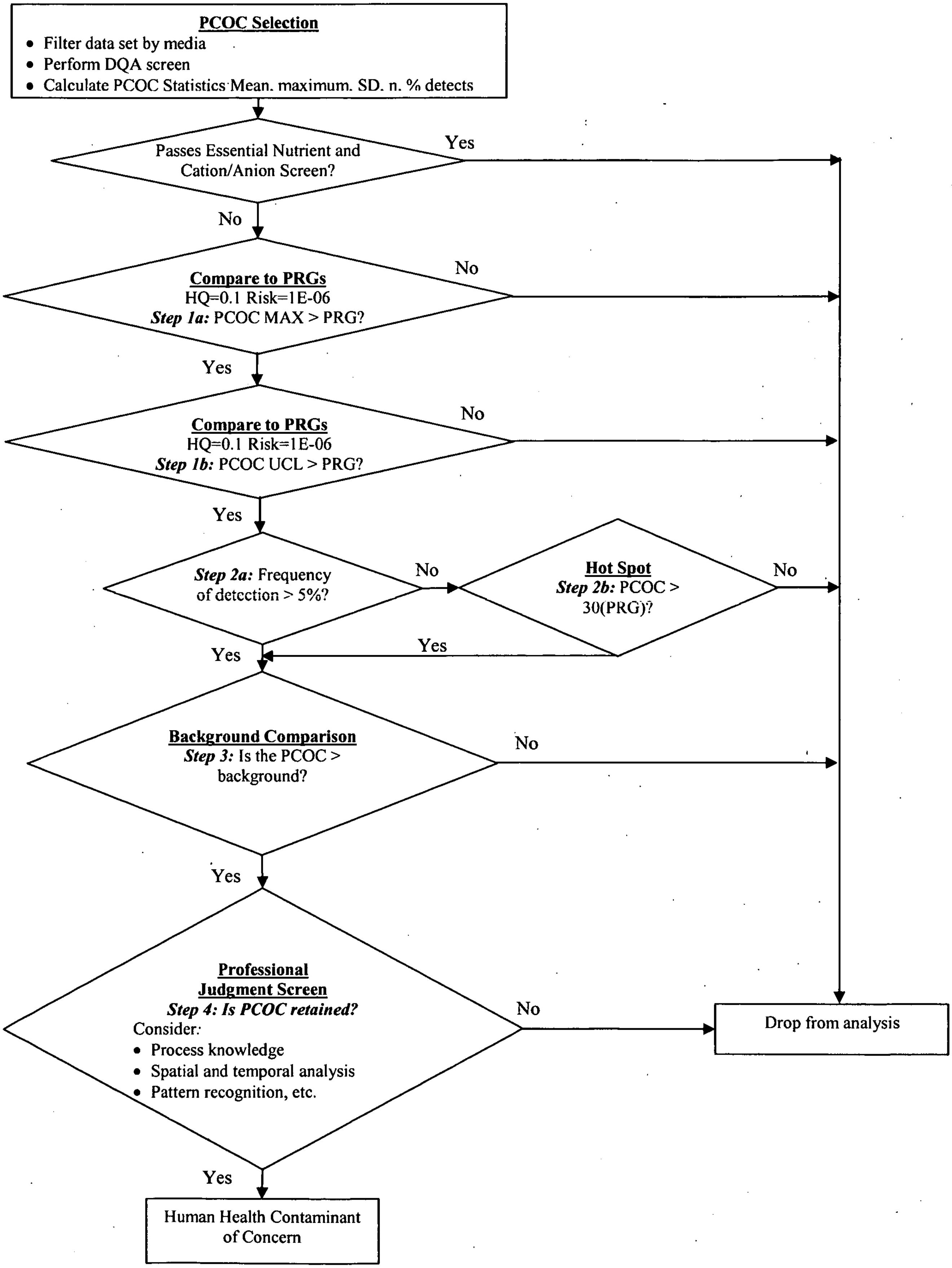
The DQA will be conducted to assess the quality of reported data as described in Section 3.1.5. Data will be assessed on a Sitewide and EU basis, as appropriate, for the risk assessment to be performed. Outliers will also be assessed using standard statistical testing and eliminated, if appropriate.

4.4.3 Data Aggregation

The data will be aggregated by area (that is, Sitewide and EU), media (for example, surface soil), and analyte prior to initiation of the DQA and COC screening processes. A value of one-half the reported value will be used for all U-qualified (nondetects) inorganic and organic data (EPA 1989). This does not apply to radionuclides, for which reported values will be used in all cases. A summary presentation of the data will include:

40

Figure 4.4 Human Health CRA COC Selection Process



41

- Chemical name;
- Chemical Abstract Service (CAS) number;
- Chemical-specific, contract-required quantitation limit (CRQL);
- Reported detection limit;
- Number of samples;
- Frequency of detection;
- Minimum detected concentration;
- Maximum detected concentration;
- Arithmetic mean concentration; and
- Standard deviation.

4.4.4 Elimination of Essential Nutrients/Major Cations and Anions

Intakes calculated based on maximum concentrations of essential nutrients in soil and sediment samples that have no toxicity values will be compared to daily reference intakes (DRIs) and upper limit daily nutrient intakes (ULs) in accordance with EPA guidance (1989). All essential nutrients that fall within the range of recommended or maximum daily intakes (NAS 2000, 2002) will be eliminated from further consideration in the CRA.

Nitrate, nitrite, ammonium, and fluoride have oral toxicological factors and will be assessed in the surface water screen. Nitrate will also be assessed in soil, due to its presence in groundwater. Sulfide, bicarbonate, bromide, carbonate, chloride, orthophosphate, and sulfate have no toxicological factors and will be eliminated from assessments in soil and sediments.

4.4.5 Preliminary Remediation Goals Screen

All remaining potential contaminants of concern (PCOCs) will be screened against the screening-level WRW PRGs presented in Appendix A for the appropriate media using a hazard quotient (HQ) of 0.1 or risk of 1×10^{-6}. All PCOCs with maximum values and upper confidence limits on the means (UCLs) below the WRW PRGs will be eliminated for an EU. The UCL calculations are described in Section 4.4.7. The PRG ratios for each PCOC will be presented in tables.

4.4.6 Detection Frequency Filter

Compounds detected at a frequency of 5 percent or greater will be carried through the COC selection process. Compounds detected at less than 5 percent frequency are not considered characteristic of Site contamination and the potential for exposure is low.

All analytes with less than 5 percent detection frequency will be compared with 30 times the Site PRGs as a health-protective precaution documented in the IABZSAP) (DOE 2004a) (referred to as 3 times the action level). If the maximum detected value of an infrequently detected contaminant (less than 5 percent) exceeds the screening value, it will be carried through the COC screening process.

4.4.7 Data Distribution Testing

Data distribution testing will be performed for all PCOCs retained following the PRG and frequency screens to aid in deciding the statistical test to use for comparisons to background and calculation of the EPCs. Testing will be conducted following EPA guidance (EPA 2002a) and EPA QA/G-9 methods (EPA 2000b), using the ProUCL (Version 3.0) computer program (Singh et al. 2004) developed for EPA's Office of Research and Development. ProUCL tests to determine whether data sets have normal, lognormal, or gamma distributions and then computes a conservative and stable upper confidence level (UCL) of the population mean. The statistical tests used in ProUCL for determining these data distributions are:

- Shapiro-Wilk W-Test ($n < 50$);
- Lilliefors Test ($n > 50$; note: can be used for $n < 50$ also);
- Anderson-Darling Test for gamma distribution ($n < 2{,}500$);
- Kolmogorov-Smirnov Test for gamma distribution ($n < 2{,}500$); and
- Q-Q Plots, which are also available for normal, lognormal, or gamma distributions.

The software computes statistics for the three distributions and recommends the appropriate distribution to represent the data set. The software also computes distributions to a minimum sample size of four. Distributions for all data sets will be determined as recommended in the ProUCL Handbook (Singh et al. 2004). The ProUCL recommendation will be used in all cases. Program printouts of results will be presented in the CRA Report. The assigned distribution will then be used to determine the appropriate test for background comparisons and estimate an appropriate UCL of the mean at a 95 percent level (95UCL) concentration.

4.4.8 Background Analysis

Following the determination of data distributions, inorganic and radionuclide PCOCs will be compared statistically to background data sets to determine whether the PCOCs are present at concentrations above background.

The background comparison is used to distinguish between contamination associated with Site activities and nonanthropogenic (naturally occurring) background conditions. The Geochemical Characterization of Background Surface Soils: Background Soils Characterization Program, Final Report (DOE 1995a) will be used for the surface soil background data. The Background Geochemical Characterization Report (BGCR) (DOE 1993) will be used for the remaining media types. Background comparisons will be performed in accordance with current EPA guidance (2002b).

For subsurface soil, stream sediment, and stream surface water, the CRA will use most of the BGCR sample locations. Based on the consultative process with the agencies, data for three downstream sampling locations will be removed from the BGCR background data set; SW004/SED022 and SW108/SED021 in the Rock Creek drainage, and SW041/SED041/SED017 in the Woman Creek drainage (Figure 4.5). Because only sediment and surface water data for streams, and not seeps, are used for background data, SED018, SED019, and SW131 in the Antelope Springs area of the Woman Creek drainage were also removed because these sampling locations are associated with seeps.

43

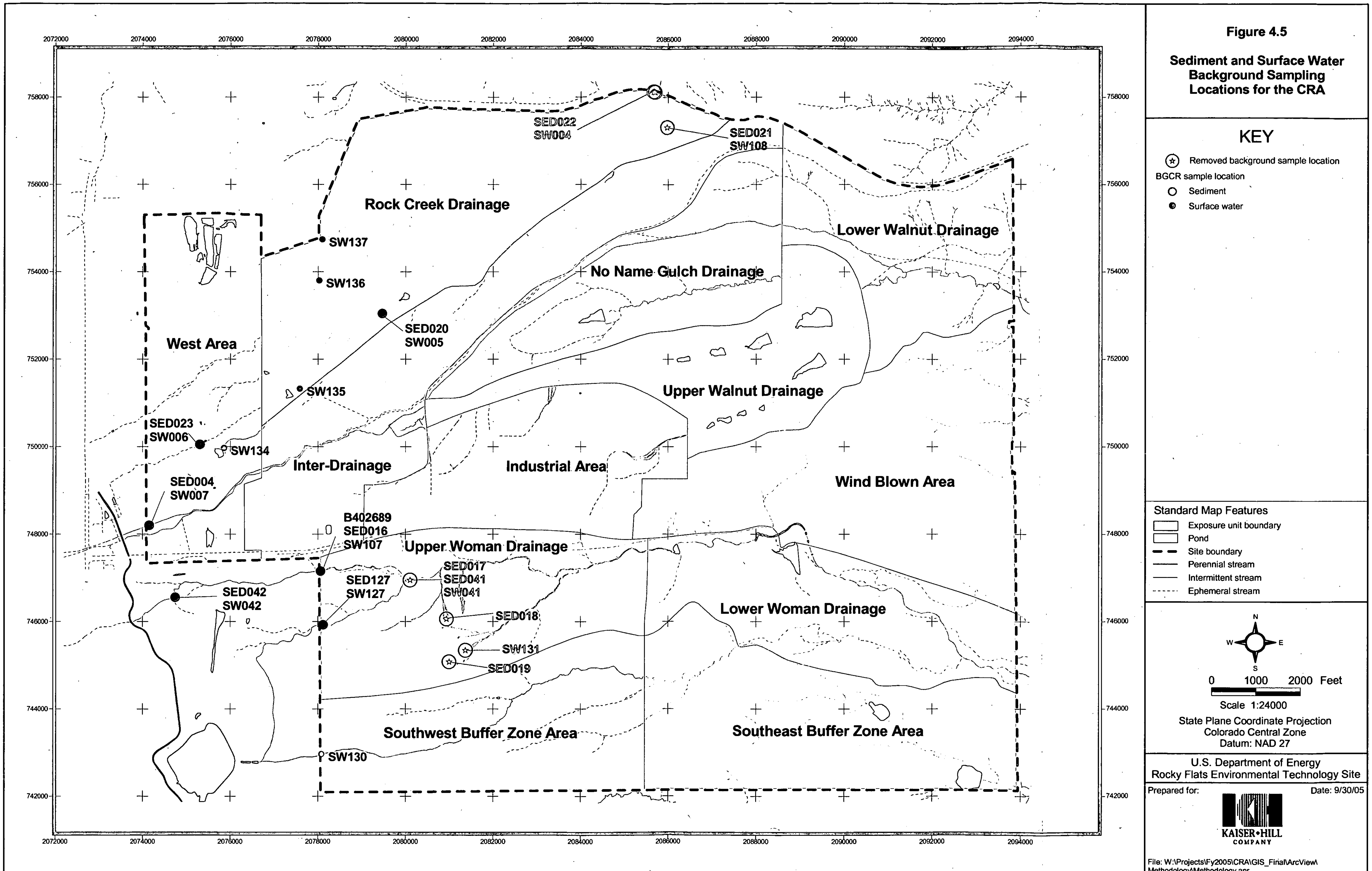


Figure 4.5

Sediment and Surface Water Background Sampling Locations for the CRA

For all remaining BGCR background sampling locations, all BGCR data will be used as well as all data collected through 2004 at these locations (applicable to surface water and sediment sampling).

In determining COCs and Ecological Contaminants of Potential Concern (ECOPCs), EU and AEU data will be statistically compared to the appropriate background data set to determine if the analytes are at concentrations within background levels in the EU/AEU. Before performing the statistical comparison, background data for locations within an EU/AEU will be removed from the EU/AEU data set, as appropriate.

The statistical test chosen for a particular PCOC depends on the distributions of the PCOC and background data. Either parametric or nonparametric tests can be used, although neither works well with small data sets of less than 25 samples (EPA 2002b). The Wilcoxon (also known as Mann-Whitney) Rank Sum Test is useful when Site and background data have different assigned distributions or are both nonparametric (that is, neither normally nor lognormally distributed). If Site and background data have the same normal or lognormal distributions, a Student's t-test can be used to compare PCOCs to background. Lognormal data are log-transformed prior to conducting a standard t-test. Evaluation of 95 percent confidence intervals for Site and background data can also be useful. Overlap of 95 percent confidence intervals indicates the Site data are within the range of natural background.

If concentrations for a particular PCOC are found to be significantly greater (alpha = 0.1, when applicable) than background levels, the PCOC will be retained for further consideration. Following the background comparison, professional judgment will be applied, as described in the next section.

4.4.9 Professional Judgment

Professional judgment is also used to include or exclude a PCOC from the final COC list. A PCOC that has been previously eliminated may be included because of a preponderance of historical data suggesting the chemical may have been released in significant quantities to the environment. Professional judgment can also be applied to develop a weight-of-evidence argument to exclude a PCOC based on data assessment, or spatial, temporal, or pattern-recognition concepts. All such decisions will be documented in the CRA Report.

Data assessment includes an evaluation of laboratory and validation qualifiers. Spatial analysis requires that concentrations of each PCOC be plotted on a map; assessment of the plotted data should indicate their presence (or absence) or any spatial or temporal trends in concentration, and assist in delimiting hot spots.

Temporal analysis is particularly relevant for groundwater data, where repeated sampling at a well offers the opportunity to evaluate changes in analyte concentrations over time. Time-series plots are used for this evaluation. Temporal analysis of data for sediments or other geologic materials is less useful and may not even be applicable.

Pattern recognition includes:

- Interelement correlations;
- Similarities in geochemical behavior;

- Correlations between elemental concentrations and certain parameters such as total suspended solids (TSS), the negative logarithm of the hydrogen ion activity (pH), reduction-oxidation potential (standard reduction potential [volts] [Eh] or negative logarithm of the electron activity [Pe], where Eh=0.059 Pe), clay content, organic content, cation-exchange capacity, and so forth; and
- Other recognizable patterns in elemental behavior.

Professional judgment will be applied on a case-by-case basis. All such judgment will be supported by a thorough analysis of the available evidence. Documentation, including maps, figures, and references supporting the professional judgment, will be presented.

4.4.10 Presentation of Contaminants of Concern

The COC selection process will be documented in tables, such as Table 4.6, which will summarize the data for each analyte chosen as a COC in each medium.

Table 4.6 Rationale for Selecting COCs

Analyte	PRG Ratio	Detection Frequency (%)	Concentration > 30X the PRG?	Background Comparison	Professional Judgment	COC?

4.5 Pathway Significance Evaluations

Two pathways for the WRW are currently considered to have insignificant contributions to risk:

1. Ingestion of contaminants transported from groundwater to surface water; and
2. Inhalation of contaminants volatilizing from groundwater and soil outside the ICA.

Evaluations will be completed to ensure that the designation as insignificant is appropriate. The evaluations are described below.

4.5.1 Groundwater-to-Surface Water Pathway

In the WRW scenario, the worker is potentially exposed to contaminants in surface water by ingestion while working. This pathway is currently considered insignificant. If contaminants known to be present in groundwater are transported to surface water in sufficient

46

concentrations, this pathway could become a significant contributor to risk. The results of groundwater transport modeling will address this issue. Groundwater modeling for the Site is being conducted for a variety of purposes, one of which is to support the CRA. The objective of the transport modeling in support of the CRA is to simulate transport of contaminants from groundwater to surface water, and estimate future exposure concentrations in surface water for potential on-site receptors. A subsurface water transport model is under development to estimate surface water concentrations for the analytes selected by a screening procedure, using surface water PRGs developed for WRW (Appendix A) and ecological receptor (DOE et al. 1996 [as modified]) exposures to surface water.

The estimated and/or observed concentrations at select surface water locations will be subjected to the COC selection process in the CRA. Results will be used to estimate potential human health or ecological effects from surface water concentrations resulting from the transport of contaminants currently in groundwater. The transport model will be calibrated using available information on contaminant sources, current contaminant distributions, and historical concentrations over time. DQOs for the modeling effort will accompany its documentation.

4.5.2 Groundwater/Subsurface Soil-to-Air Pathway

In the WRW scenario, the worker is potentially exposed to contaminants in groundwater that volatilize and are transported through the soil and released to the atmosphere, where they can be inhaled by the worker. Exposure to volatilized contaminants can occur indoors or outdoors. These pathways are both currently considered insignificant. The indoor route is considered a greater contributor to risk due to inhibited air exchange in buildings. If contaminants known to be present in groundwater are transported to the soil surface and then to the atmosphere in sufficient concentrations, the indoor pathway could become a significant contributor to risk. The groundwater/subsurface soil air pathway for volatiles will be assessed using the PRGs presented in Appendix A.

4.6 Exposure Point Concentrations and Intakes

The EPC of a human health COC in a sampled medium is often quantified using the 95UCL of the arithmetic mean (EPA 1989). This approach ignores any sampling bias toward areas of known or suspected contamination and treats the data as if they were randomly collected. At RFETS, the majority of the sampling effort has targeted IHSSs, PACs and other areas with suspected releases. This unequal sampling density is not compatible with the problem statement in Section 3.1.1, which states that long-term average exposures in an EU must be estimated. In areas with biased sampling the arithmetic mean is a worst-case or upper-bound estimate of risk. Therefore, a three-tiered approach, as presented below, will be used to calculate EPCs for the HHRA. In the first tier, EPCs will be calculated without correcting for sampling bias, but the subsequent evaluations will use Geospatial techniques that can be used to correct for such bias.

<u>Tier 1: Mean Concentrations</u> - The arithmetic mean is a statistically robust estimator, even when normality assumptions are not met (Gilbert 1987). The 95UCL is a conservative estimate of the average concentration to which receptors would be exposed over time in an exposure area. If the maximum detected COC value is below the 95UCL, the maximum concentration is used as the EPC. When data distributions are demonstrated to be lognormal,

ld

an arithmetic mean and 95UCL will be calculated using log-transformed data. When distributions are found to be neither normal nor lognormal, a nonparametric 95UCL will be calculated (EPA 2002b).

Tier 2: Area Averaging - The geospatial technique of area averaging will also be used to provide a more realistic estimate of health risks and hazards. This approach is simple and easy to implement and will very likely yield much more realistic estimates of the true mean, and it is expected that 95UCLs generated in this way will minimize the risk of Type I errors.

The Tier 2 approach will be implemented in four steps for the HHRA:

1. A 30-acre grid will be randomly laid over the Site or EU.
2. The mean value will be calculated for each 30-acre cell, using all relevant samples from within the cell. For nondetects, one-half the reported result will be used as a proxy value for calculating the mean.
3. The grid means will be used to calculate the best estimate of the mean for the EU as an area-weighted average. If no sample occurs in a grid cell, then that cell is not used in the calculation and its area is taken out of the total area of the EU for the area weighting of the mean.
4. The uncertainty around the best estimate of the mean will be estimated using the same method as for Tier 1. The 95UCL of the EU area-weighted mean will be used as the EPC.

Tier 3: Kriging – This geostatistical method, developed for the mining industry, is a more robust and statistically valid approach for estimating values and uncertainty around key statistics (mean, 90th percentile) than area averaging. Kriging can accurately account for the uneven spatial distribution of samples. However, various parameters developed for a specific application are subject to debate among experts. Therefore, this approach will be implemented only as needed after an initial analysis using Tiers 1 and 2.

4.6.1 Exposure Point Concentration Calculation

The one-sided 95UCL will be calculated using the ProUCL software. When a data set is determined to be parametrically distributed (normal, lognormal, or gamma), the program uses one of five parametric computation methods for estimating the UCL:

1. Student's-t UCL (normal distribution);
2. Land's-H UCL (lognormal distribution);
3. Chebyshev inequality-based UCL (using minimum variance and unbiased estimates of parameters of a lognormal distribution);
4. Approximate gamma UCL using the chi-square approximation (gamma distribution); and
5. Adjusted gamma UCL (adjusted for level of significance).

ProUCL includes 10 methods for computation of UCLs when a data set is determined to have a nonparametric distribution. The program recommends the appropriate UCL to choose based on the characteristics of the data set. The available methods include:

1. Central limit theorem-based UCL;
2. Modified-t statistic-based UCL;
3. Adjusted central limit theorem-based UCL (adjusted for skewness);
4. Chebyshev inequality-based UCL (using the sample mean and sample standard deviation);
5. Jackknife method-based UCL;
6. Standard bootstrap-based UCL;
7. Percentile-based UCL;
8. Bias-corrected accelerated bootstrap-based UCL;
9. Bootstrap-t-based UCL; and
10. Hall's bootstrap-based UCL.

EPCs will be estimated at human receptor locations for all pertinent environmental media, including surface and subsurface soil and sediment. The physical, chemical, and hydrogeologic characteristics of the Site must therefore be adequately understood. Steady-state conditions will be assumed for EPCs based on direct environmental monitoring data or modeling, if appropriate. Effects of dilution, dispersion, source-term depletion, erosion, biodegradation, and sorption on quantification of the EPCs will be addressed in the uncertainty section of the CRA. EPCs will be estimated to predict long-term averages and impacts to receptors.

4.6.2 Intake Calculations

Intake by receptors will be quantified for each selected COC, exposure pathway, and exposure scenario. Exposure factors reported in Section 4.1 will be used in the CRA. Intake in units of mg/kg per day will be calculated for all receptors exposed to ingestion, dermal, and inhalation pathways using the general formulas below. Radiological intake in units of picocuries (pCi) will be assessed using the standard EPA formulas. External radionuclide exposure is calculated in units of years per picocurie per gram (yr/pCi/g).

The equations for calculating intakes for the WRW and WRV are provided in Tables 4.7 and 4.8, respectively. The abbreviations and specific values used for the exposure factors are defined in Tables 4.1 and 4.2.

Intakes are averaged over different time periods for carcinogenic and noncarcinogenic chemicals. For carcinogens, intakes are calculated by averaging the total cumulative dose during the exposure period over a lifetime, yielding a "lifetime average daily intake" (EPA 1989). For noncarcinogenic chemicals, intakes are calculated by averaging over the period of exposure to yield an average daily intake. Different averaging times are used for carcinogens and noncarcinogens because their effects occur by different mechanisms. The approach for carcinogens is based on the hypothesis that a high dose received over a short period of time is equivalent to a corresponding low dose spread over a lifetime. The intake of a carcinogen is averaged over a 70-year lifetime regardless of exposure duration.

49

For calculation of radionuclide intakes from soil, the exposure concentration is expressed in picocuries per gram (pCi/g), and the expression is not divided by body weight or averaging time. The resulting intake for radionuclides is expressed in pCi.

Table 4.7 Intake Equations for the WRW

Wildlife Refuge Worker[a]
Surface Soil and Sediment Intake Equations
Intake Equations for WRW Ingestion
Nonradionuclide Intake (mg/kg-day) = $\frac{\text{(Cs x Irwss x Efwss x Edw x CF1)}}{\text{(Bwa x [Atc or Atnc]}^{b}\text{)}}$
Radionuclide Intake (pCi) = Cs x Irwss x Efwss x Edw x CF3
Intake Equation for WRW Dermal Contact
Nonradionuclide Intake (mg/kg-day) = $\frac{\text{(Cs x Efwss x Edw x Evw x Saw x Afw x ABS x CF1)}}{\text{(Bwa x [Atc or Atnc]}^{b}\text{)}}$
Intake Equations for WRW Outdoor Inhalation of Suspended Particulates
Nonradionuclide Intake (mg/kg-day) = $\frac{\text{(Cs x Iraw x Efwss x Edw x Etw x Eto\_w x MLF)}}{\text{(Bwa x [Atc or Atnc]}^{b}\text{)}}$
Radionuclide Intake (pCi) = Cs x Iraw x Efwss x Edw x Etw x Eto_w x MLF x CF2
Intake Equations for WRW Indoor Inhalation of Suspended Particulates
Nonradionuclide Intake (mg/kg-day) = $\frac{\text{(Cs x Iraw x Efwss x Edw x Etw x Eti\_w x Dfi x MLF)}}{\text{(Bwa x [Atc or Atnc]}^{b}\text{)}}$
Radionuclide Intake (pCi) = Cs x Iraw x Efwss x Edw x Etw x Eti_w x Dfi x MLF x CF2
Exposure Equation for WRW Outdoor External Radiation
Radionuclide Exposure (yr-pCi/g) = Cs x Te_A x Te_Do x Edw x ACF x GSFo
Exposure Equation for WRW Indoor External Radiation
Radionuclide Exposure (yr-pCi/g) = Cs x Te_A x Te_Di x Edw x ACF x GSFi
Subsurface Soil Intake Equations
Intake Equations for WRW Ingestion
Nonradionuclide Intake (mg/kg-day) = $\frac{\text{(Cs x Irwss x Efwsub x Edw x CF1)}}{\text{(Bwa x [Atc or Atnc]}^{b}\text{)}}$
Radionuclide Intake (pCi) = Cs x Irwss x Efwsub x Edw x CF3
Intake Equation for WRW Dermal Contact
Nonradionuclide Intake (mg/kg-day) = $\frac{\text{(Cs x Efwsub x Edw x Evw x Saw x Afw x ABS x CF1)}}{\text{(Bwa x [Atc or Atnc]}^{b}\text{)}}$
Intake Equations for WRW Outdoor Inhalation of Suspended Particulates
Nonradionuclide Intake (mg/kg-day) = $\frac{\text{(Cs x Iraw x Efwsub x Edw x Etw x Eto\_w x MLF)}}{\text{(Bwa x [Atc or Atnc]}^{b}\text{)}}$
Radionuclide Intake (pCi) = Cs x Iraw x Efwsub x Edw x Etw x Eto_w x MLF x CF2
Exposure Equation for WRW Outdoor External Radiation
Radionuclide Exposure (yr-pCi/g) = Cs x Te_As x Te_Do x Edw x ACF x GSFo

a. Definitions of abbreviations can be found in Table 4.1.
b. Carcinogenic or noncarcinogenic averaging times (Atc and Atnc, respectively) are used in equations, depending on whether carcinogenic or noncarcinogenic intakes are being calculated.

50

Table 4.8 Intake Equations for the WRV

Wildlife Refuge Visitor[a]
Intake Equations for WRV Ingestion of Soil
Nonradionuclide Intake (mg/kg-day) = (Cs x SIRageav x Efv x CF1) / [Atc or Atnc][b]
Radionuclide Intake (pCi) = Cs x SIRagav_r x Efv x Edt x CF3 units
Intake Equation for WRV Dermal Contact with Soil
Nonradionuclide Intake (mg/kg-day) = (Cs x Efv x Evv x SFSagav x ABS x CF1) / [Atc or Atnc][b]
Intake Equations for WRV Inhalation of Surface Soil
Nonradionuclide Intake (mg/kg-day) = (Cs x Iragav x Efv x MLF) / [Atc or Atnc][b]
Radionuclide Intake (pCi) = Cs x Iragav_r x Efv x (Edav + Edcv) x Etv x MLF x CF2
Exposure Equation for WRV External Radiation from Surface Soil
Radionuclide Intake (yr-pCi/g) = Cs x Te_Av x Te_Dv x ACF x GSFo x (Edav + Edcv)

a. Definitions of abbreviations can be found in Table 4.2.
b. Carcinogenic or noncarcinogenic averaging times (Atc and Atnc, respectively) are used in equations, depending on whether carcinogenic or noncarcinogenic intakes are being calculated.

5.0 HUMAN HEALTH TOXICITY ASSESSMENT

Actions: Determine toxicity values and modes of action and endpoints for PCOCs.

Toxicity values are used to characterize risk, while toxicity profiles summarize toxicological information for radioactive and nonradioactive COCs. Toxicity information is summarized for two categories of potential effects: noncarcinogenic and carcinogenic. These two categories have slightly differing methodologies for estimating potential health risks associated with exposures to carcinogens and noncarcinogens.

In general, toxicity profiles are obtained from EPA's Integrated Risk Information System (IRIS) (EPA 2004a). IRIS contains only those toxicity values that have been verified and undergone extensive peer review by EPA's Reference Dose or Carcinogenic Risk Assessment Verification Endeavor (CRAVE) Workgroups. The IRIS database is updated monthly and supersedes all other sources of toxicity information.

The CRA generally uses the recommended hierarchy of toxicological sources of information recommended by EPA (EPA 2003a). The recommended toxicity value hierarchy is as follows:

- Tier 1 – EPA's IRIS (EPA 2004a)
- Tier 2 – EPA's Provisional Peer Reviewed Toxicity Values (PPRTVs) – The Office of Research and Development/National Center for Environmental Assessment

51

(NCEA)/Superfund Health Risk Technical Support Center (STSC) develops PPRTVs on a chemical-specific basis when requested by EPA's Superfund program.

- Tier 3 – Other Toxicity Values – Tier 3 includes additional EPA and non-EPA sources of toxicity information. Priority is given to those sources of information that are the most current, the basis for which is transparent and publicly available, and which have been peer reviewed. Consensus will be sought on all toxicity values used in the CRA.

Secondary sources of information will be used qualitatively in the HHRA. EPA toxicologists, both regional and national, may also serve as information sources. All information sources will be documented in the toxicity assessment. In general, the toxicity factors used for the Site PRGs will be used in the CRA, unless updates become available.

5.1 Identification of Toxicity Values for Carcinogenic Effects

Potential carcinogenic risks will be expressed as an estimated probability that an individual might develop cancer from lifetime exposure. This probability is based on projected intakes and chemical-specific dose-response data called "cancer slope factors (CSFs)." CSFs and the estimated daily intake of a compound, averaged over a lifetime, are used to estimate the incremental risk that an individual exposed to that compound may develop cancer. There are two classes of potential carcinogens: chemical carcinogens and radionuclides.

5.1.1 Chemical Carcinogens

Evidence of chemical carcinogenicity originates primarily from two sources: lifetime studies with laboratory animals and human (epidemiological) studies. Animal data from laboratory experiments represent the primary basis for the extrapolation for most chemical carcinogens. Experimental results are extrapolated across species (that is, from laboratory animals to humans); from high-dose regions (that is, levels to which laboratory animals are exposed) to low-dose regions (that is, levels to which humans are likely to be exposed in the environment); and across routes of administration (for example, inhalation versus ingestion).

EPA estimates human cancer risks associated with exposure to chemical carcinogens on an administered-dose basis. It is assumed a small number of molecular events can evoke changes in a single cell that can lead to uncontrolled cellular proliferation and tumor induction. This mechanism for carcinogenesis means there is theoretically no level of exposure to a given chemical carcinogen that does not pose a small, but finite, probability of generating a carcinogenic response.

The CSFs are estimated using the linearized multistage model. The basis of this model is that multiple events may be needed to yield tumor induction (Crump et al. 1977) reflecting the biological variability in tumor frequencies observed in animal and human studies. The dose-response relationship predicted by this model at low doses is essentially linear. The CSFs calculated for nonradiological carcinogens using the multistage model represent the 95UCL of the probability of a carcinogenic response. Consequently, risk estimates based on these CSFs are conservative estimates representing upper-bound estimates of risk.

Uncertainties in the toxicity assessment for chemical carcinogens are dealt with by classifying each chemical into one of several groups, according to the EPA-defined, weight-

57

of-evidence (WOE) from epidemiological studies and animal studies. These groups are listed in Table 5.1.

Table 5.1 Carcinogen Groups

Weight-of-Evidence Group	Description
A	Human carcinogen (sufficient evidence of carcinogenicity in humans)
B 1	Probable human carcinogen (sufficient evidence of carcinogenicity in animals, limited evidence of carcinogenicity in humans)
B 2	Probable human carcinogen (sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans)
C	Possible human carcinogen (limited evidence of carcinogenicity in animals and inadequate or lack of human data)
D	Not classifiable as to human carcinogenicity (inadequate or no evidence)
E	Evidence of noncarcinogenicity in humans (no evidence of carcinogenicity in adequate studies)

The oral and inhalation CSFs for the COCs will be compiled in a table. Table 5.2 presents the current CSFs used for calculation of the PRGs. The WOE designations and target organs are also included. These values will be used in the CRA risk characterization. A similar table of values will be included in the CRA for COCs.

5.1.2 Radionuclides

A series of federal guidance documents have been issued by EPA for the purpose of providing federal and state agencies with technical information to assist their implementation of radiation protection programs. The Health Effects Assessment Summary Tables (HEAST) for Radionuclides (EPA 2001a) provides numerical factors, called "risk coefficients," for estimating risks to health from exposure to radionuclides. This federal guidance will be used to calculate risk from radionuclides. It applies state-of-the-art methods and models that take into account age and gender dependence on intake, metabolism, dosimetry, radiogenic risk, and competing causes of death in estimating the risks to health from internal or external exposure to radionuclides.

A morbidity risk coefficient is provided for a given radionuclide and exposure mode. This coefficient is an estimate of the average total risk of experiencing a radiogenic cancer, regardless of whether the cancer is fatal. The risk coefficient associated with morbidity will be used to characterize human health risks. Current values used are shown in Table 5.3.

Table 5.2 Nonradiological Cancer Slope Factors, Weight of Evidence and Target Organs

Analyte List	CAS Number	Oral/Ingestion Slope Factor (mg/kg-day)$^{-1}$	Source	Inhalation Unit Risk (m^3/μg)	Source	Inhalation Slope Factor (mg/kg-day)$^{-1}$	Source	Weight of Evidence	Target Organ/Cancer	Source
Acenaphthene	83-32-9									
Acenaphthylene	208-96-8							D		I
Acetone	67-64-1									
Acrolein	107-02-8									
Acrylonitrile	107-13-1	5.40E-01	I	6.80E-05	I	2.38E-01	I	B1	Brain, spinal cord, stomach, lungs	I
Alachlor	15972-60-8	8.00E-02	H							
Aldicarb	116-06-3							D		I
Aldicarb sulfone	1646-88-4									
Aldicarb sulfoxide	1646-87-3									
Aldrin	309-00-2	1.70E+01	I	4.90E-03	I	1.72E+01	I	B2	Liver	I
Aluminum	7429-90-5									
Ammonium (as ammonia)	7664-41-7									
Anthracene	120-12-7							D	NC	I
Antimony	7440-36-0									
Aroclor 1016	12674-11-2	2.00E+00	Ia	1.00E-04	Ia	4.00E-01	Ia	B2	Liver	I
Aroclor 1221	11104-28-2	2.00E+00	Ia	1.00E-04	Ia	4.00E-01	Ia	B2	Liver	I
Aroclor 1232	11141-16-5	2.00E+00	Ia	1.00E-04	Ia	4.00E-01	Ia	B2	Liver	I
Aroclor 1242	53469-21-9	2.00E+00	Ia	1.00E-04	Ia	4.00E-01	Ia	B2	Liver	I
Aroclor 1248	12672-29-6	2.00E+00	Ia	1.00E-04	Ia	4.00E-01	Ia	B2	Liver	I
Aroclor 1254	11097-69-1	2.00E+00	Ia	1.00E-04	Ia	4.00E-01	Ia	B2	Liver	I
Aroclor 1260	11096-82-5	2.00E+00	Ia	1.00E-04	Ia	4.00E-01	Ia	B2	Liver	I
Arsenic	7440-38-2	1.50E+00	I	4.30E-03	I	1.51E+01	I	A	Skin, lungs	I
Atrazine	1912-24-9	2.20E-01	H					D	NC	R
Barium	7440-39-3							D	NC	I
Benzene	71-43-2	5.50E-02	I	7.80E-06	I	2.73E-02	I	A	Leukemia	I
Benzidine	92-87-5	2.30E+02		6.70E-02	I	2.35E+02	I	A	Bladder cancer	
Benzo(a)anthracene	56-55-3	7.30E-01	P					B2	Tumors	A
Benzo(a)pyrene	50-32-8	7.30E+00	I			3.10E-01	P	B2	Tumors	A
Benzo(b)fluoranthene	205-99-2	7.30E-01	P					B2	Lungs, skin	I
Benzo(g,h,i)perylene	191-24-2							D		I

Table 5.2 Nonradiological Cancer Slope Factors, Weight of Evidence and Target Organs

Analyte List	CAS Number	Oral/Ingestion Slope Factor (mg/kg-day)$^{-1}$	Source	Inhalation Unit Risk (m^3/µg)	Source	Inhalation Slope Factor (mg/kg-day)$^{-1}$	Source	Weight of Evidence	Target Organ/Cancer	Source
Benzo(k)fluoranthene	207-08-9	7.30E-02	P					B2	Lungs, skin	I
Benzoic Acid (at pH 7)	65-85-0							D	NC	I
Benzyl Alcohol	100-51-6									
Beryllium	7440-41-7			2.40E-03	I	8.40E+00	I	B1	Lungs	I
bis(2-chloroethyl)ether	111-44-4	1.10E+00	I	3.30E-04	I	1.16E+00	I	B2	Liver	I
bis(2-chloroisopropyl)ether	108-60-1	7.00E-02	H	1.00E-05	H	3.50E-02	H	D	Liver	R
bis(2-ethylhexyl)phthalate	117-81-7	1.40E-02	I			1.40E-02	P	B2	Liver	I
Boron	7440-42-8									
Bromodichloromethane	75-27-4	6.20E-02	I					B2	Liver, kidneys, and intestines	R
Bromoform	75-25-2	7.9E-03	I	1.10E-06	I	3.85E-03	I	B2	Intestines	I
Bromomethane (methyl bromide)	74-83-9							D	NC	I
2-Butanone (methyl ethyl ketone)	78-93-3							D	NC	I
Butylbenzylphthalate	85-68-7							C	Leukemia	I
Cadmium (food)	7440-43-9			1.80E-03	I	6.30E+00	I	B1	Lung, trachea, bronchus	I
Cadmium (water)	7440-43-9			1.80E-03	I	6.30E+00	I	B1	Lung, trachea, bronchus	I
Carbazole	86-74-8	2.00E-02	H					D	NC	R
Carbofuran	1563-66-2									
Carbon disulfide	75-15-0									
Carbon tetrachloride	56-23-5	1.30E-01	I	1.50E-05	I	5.25E-02	I	B2	Liver	I
Chlordane-alpha	5103-71-9	3.50E-01	Ib	1.00E-04	Ib	3.50E-01	Ib	B2	Liver	I
Chlordane-beta	5103-74-2	3.50E-01	Ib	1.00E-04	Ib	3.50E-01	Ib	B2	Liver	I
Chlordane-gamma	12789-03-6	3.50E-01	Ib	1.00E-04	Ib	3.50E-01	Ib	B2	Liver	I
4-Chloroaniline	106-47-8									
Chlorobenzene	108-90-7							D	NC	I
Chloroethane (ethyl chloride)	75-00-3	2.90E-03	P					D	NC	R
Chloroform	67-66-3			2.30E-05	I	8.05E-02	I	B2	Liver	I
Chloromethane (methyl chloride)	74-87-3							D	NC	I
4-Chloro-3-methylphenol	59-50-7									
2-Chloronaphthalene	91-58-7									
2-Chlorophenol	95-57-8									

56

Table 5.2 Nonradiological Cancer Slope Factors, Weight of Evidence and Target Organs

Analyte List	CAS Number	Oral/Ingestion Slope Factor $(mg/kg\text{-}day)^{-1}$	Source	Inhalation Unit Risk $(m^3/\mu g)$	Source	Inhalation Slope Factor $(mg/kg\text{-}day)^{-1}$	Source	Weight of Evidence	Target Organ/Cancer	Source
Chlorpyrifos	2921-88-2									
Chromium III	16065-83-1							D	NC	I
Chromium VI	18540-29-9			1.20E-02	I	4.20E+01	I	Ai, Do	Lung	I
Chrysene	218-01-9	7.30E-03	P					B2	Skin, blood	I
Cobalt	7440-48-4					9.80E+00	P	B2	Induction of tumors	R
Copper	7440-50-8							D	NC	I
Cyanide	57-12-5							D	NC	I
Cyclohexane	110-82-7									
4,4-DDD	72-54-8	2.40E-01	I					B2	Lung, liver, and thyroid	I
4,4-DDE	72-55-9	3.40E-01	I					B2	Liver and thyroid	I
4,4-DDT	50-29-3	3.40E-01	I	9.70E-05	I	3.40E-01	I	B2	Liver	I
Dalapon	75-99-0									
Demeton	8065-48-3									
Dibenzo(a,h)anthracene	53-70-3	7.30E+00	P					B2	DNA damage/gene mutation	I
Dibenzofuran	132-64-9							D	NC	I
Dibromochloromethane	124-48-1	8.40E-02	I					C	Liver	I
1,2-Dibromo-3-chloropropane	96-12-8	1.40E+00	H			2.40E-03	H			
Dicamba	1918-00-9									
1,2-Dichlorobenzene (o-)	95-50-1							D	NC	I
1,3-Dichlorobenzene	541-73-1							D	NC	I
1,4-Dichlorobenzene (p-)	106-46-7	2.40E-02	H			2.20E-02	P	B2	Liver	R
3,3-Dichlorobenzidine	91-94-1	4.50E-01	I					B2	Mammaries	I
Dichlorodifluoromethane	75-71-8									
1,1-Dichloroethane	75-34-3							C	Mammaries/Hemangiosarcomas	I
1,2-Dichloroethane	107-06-2	9.10E-02	I	2.60E-05	I	9.10E-02	I	B2	Hemangiosarcomas	I
1,1-Dichloroethene	75-35-4							C		I
1,2-Dichloroethene (total)	540-59-0									
2,4-Dichlorophenol	120-83-2									
Dichlorophenoxyacetic acid (2,4-D)	94-75-7									
4-(2,4-Dichlorophenoxy) butyric acid (2,4-	94-82-6									

Table 5.2 Nonradiological Cancer Slope Factors, Weight of Evidence and Target Organs

Analyte List	CAS Number	Oral/Ingestion Slope Factor (mg/kg-day)$^{-1}$	Source	Inhalation Unit Risk (m^3/µg)	Source	Inhalation Slope Factor (mg/kg-day)$^{-1}$	Source	Weight of Evidence	Target Organ/Cancer	Source
DB)										
1,2-Dichloropropane	78-87-5	6.80E-02	H						Liver and mammary glands	A
1,3-Dichloropropene	542-75-6	1.00E-01	I	4.00E-06	I	1.40E-02	I	B2	Bladder	I
cis-1,3-Dichloropropene	10061-01-5	1.00E-01	Ic	4.00E-06	Ic	1.40E-02	Ic	B2	Bladder	I
trans-1,3-Dichloropropene	10061-02-6	1.00E-01	Ic	4.00E-06	Ic	1.40E-02	Ic	B2	Bladder	I
Dieldrin	60-57-1	1.60E+01	I	4.60E-03	I	1.61E+01	I	B2	Liver	I
Diethyl ether	60-29-7									
Di(2-ethylhexyl)adipate	103-23-1	1.20E-03	I					C	Liver	I
Diethylphthalate	84-66-2							D	NC	I
Dimethoate	60-51-5									
2,4-Dimethylphenol	105-67-9									
Dimethylphthalate	131-11-3							D	NC	I
Di-n-butylphthalate	84-74-2							D	NC	I
4,6-Dinitro-2-methylphenol (4,6-dinitro-o-cresol)	534-52-1									
2,4-Dinitrophenol	51-28-5									
2,4-Dinitrotoluene	121-14-2									
2,6-Dinitrotoluene	606-20-2							B2	Liver and mammaries	I
Di-n-octylphthalate	117-84-0									
Dinoseb	88-85-7							D	NC	I
1,4-Dioxane	123-91-1	1.10E-02	I					B2	Nasal, liver, and gall bladder	I
Dioxin (2,3,7,8-TCDD)	1746-01-6	1.50E+05	H			1.50E+05	H	B2	Liver	I
1,2-Diphenylhydrazine	122-66-7	8.00E-01	I	2.20E-04	I	7.70E-01	I	B2	Liver	I
Diquat	85-00-7									
Endosulfan I	959-98-8									
Endosulfan II	33213-65-9									
Endosulfan sulfate	1031-07-8									
Endosulfan (technical)	115-29-7									
Endrin (technical)	72-20-8							D	NC	I
Endrin aldehyde	7421-93-4									

Table 5.2 Nonradiological Cancer Slope Factors, Weight of Evidence and Target Organs

Analyte List	CAS Number	Oral/Ingestion Slope Factor (mg/kg-day)$^{-1}$	Source	Inhalation Unit Risk (m^3/µg)	Source	Inhalation Slope Factor (mg/kg-day)$^{-1}$	Source	Weight of Evidence	Target Organ/Cancer	Source
Endrin ketone	53494-70-5									
Ethyl acetate	141-78-6									
Ethylbenzene	100-41-4							D	NC	I
Ethylene dibromide [1,2-Dibromoethane]	106-93-4	8.50E+01	I	2.20E-04	I	7.70E-01	I	B2	Induction of tumors	I
Fluoranthene	206-44-0							D	NC	I
Fluorene	86-73-7							D	NC	I
Fluoride (as fluorine)	7782-41-4									
Glyphosate	1071-83-6							D	NC	I
Guthion	86-50-0									
Heptachlor	76-44-8	4.50E+00	I	1.30E-03	I	4.55E+00	I	B2	Liver	I
Heptachlor epoxide	1024-57-3	9.10E+00	I	2.60E-03	I	9.10E+00	I	B2	Liver	I
Hexachlorobenzene	118-74-1	1.60E+00	I	4.60E-04	I	1.61E+00	I	B2	Liver, thyroid and kidneys	I
Hexachlorobutadiene	87-68-3	7.80E-02	I	2.20E-05	I	7.70E-02	I	C	Kidneys	I
Hexachlorocyclohexane, alpha	319-84-6	6.30E+00	I	1.80E-03	I	6.30E+00	I	B2	Liver	I
Hexachlorocyclohexane, beta	319-85-7	1.80E+00	I	5.30E-04	I	1.86E+00	I	C	Liver	I
Hexachlorocyclohexane, delta	319-86-8							D	NC	I
Hexachlorocyclohexane, gamma (Lindane)	58-89-9	1.30E+00	H					B2	Liver	R
Hexachlorocyclohexane (technical)	608-73-1	1.80E+00	I	5.10E-04	I	1.79E+00	I	B2	Liver	I
Hexachlorocyclopentadiene	77-47-4							E	NOE	I
Hexachlorodibenzo-p-dioxin (mix)	34465-46-8	6.20E-03	If	1.30E+06	If	4.55E+03	If			
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7	6.20E-03	If	1.30E+06	If	4.55E+03	If	B2	Liver	I
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3	6.20E-03	If	1.30E+06	If	4.55E+03	If	B2	Liver	I
Hexachloroethane	67-72-1	1.40E-02	I	4.00E-06	I	1.40E-02	I	C	Liver	I
Indeno(1,2,3-cd)pyrene	193-39-5	7.30E-01	P					B2	Induction of tumors	I
Iron	7439-89-6									
Isobutyl alchohol	78-83-1									
Isophorone	78-59-1	9.50E-04	I					C	Preputary gland	I
Isopropylbenzene (cumene)	98-82-8					1.10E-01	I	D		O
Lead	7439-92-1							B2	Kidneys	I
Lithium	7439-93-2									

Table 5.2 Nonradiological Cancer Slope Factors, Weight of Evidence and Target Organs

Analyte List	CAS Number	Oral/Ingestion Slope Factor $(mg/kg\text{-}day)^{-1}$	Source	Inhalation Unit Risk $(m^3/\mu g)$	Source	Inhalation Slope Factor $(mg/kg\text{-}day)^{-1}$	Source	Weight of Evidence	Target Organ/Cancer	Source
Manganese (food)	7439-96-5							D	NC	I
Mercury	7439-97-6							D	NC	I
Methoxychlor	72-43-5							D	NC	I
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	94-74-6									
2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	93-65-2									
Methylene chloride (dichloromethane)	75-09-2	7.50E-03	I	4.70E-07	I	1.65E-03	I	B2	Liver	I
Methyl methacrylate	80-62-6							E	NOE	I
2-Methylnaphthalene	91-57-6									
4-Methyl-2-pentanone (methyl isobutyl ketone)	108-10-1									
2-Methylphenol (o-cresol)	95-48-7							C	Skin and gene toxicity	I
4-Methylphenol (p-cresol)	106-44-5							C	Skin and gene toxicity	I
Methyl tert-butyl ether	1634-04-4	4.0E-03	O							
Mirex	2385-85-5									
Molybdenum	7439-98-7									
Naphthalene	91-20-3							C	Lungs	I
Nickel (soluble)	7440-02-0									
Nitrate	14797-55-8									
Nitrite	14797-65-0									
2-Nitroaniline	88-74-4									
4-Nitroanaline	100-01-6	2.0E-02	P					C	Liver	OR
Nitrobenzene	98-95-3							D	NC	I
2-Nitrophenol	88-75-5									
4-Nitrophenol	100-02-7									
N-Nitroso-di-n-butylamine	924-16-3	5.40E+00	I	1.60E-03	I	5.60E+00	I	B2	Induction of tumors	I
N-Nitrosodiethylamine	55-18-5	1.50E+02	I	4.30E-02	I	1.51E+02	I	B2	Induction of tumors	I
N-Nitrosodimethylamine	62-75-9	5.10E+01	I	1.40E-02	I	4.90E+01	I	B2	Induction of tumors	I
N-Nitrosodiphenylamine	86-30-6	4.90E-03	I					B2	Bladder	I
N-Nitrosodi-N-propylamine	621-64-7	7.00E+00	I					B2	Induction of tumors	I
N-Nitrosopyrrolidine	930-55-2	2.10E+00	I	6.10E-04	I	2.14E+00	I	B2	Induction of tumors	I

Table 5.2 Nonradiological Cancer Slope Factors, Weight of Evidence and Target Organs

Analyte List	CAS Number	Oral/Ingestion Slope Factor (mg/kg-day)$^{-1}$	Source	Inhalation Unit Risk ($m^3/\mu g$)	Source	Inhalation Slope Factor (mg/kg-day)$^{-1}$	Source	Weight of Evidence	Target Organ/Cancer	Source
p-Nirotoluene	99-99-0	1.70E-02	P							
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0									
Oxamyl (vydate)	23135-22-0									
Parathion	56-38-2							C	Adrenal/thyroid glands, and pancreas	I
Pentachlorobenzene	608-93-5							D	NC	I
Pentachlorophenol	87-86-5	1.20E-01	I					B2	Induction of tumors	I
Phenanthrene	85-01-8							D		I
Phenol	108-95-2							D		I
Picloram	1918-02-1									
Pyrene	129-00-0							D	NC	I
Selenium	7782-49-2							D	NC	I
Silver	7440-22-4							D	NC	I
Simazine	122-34-9	1.20E-01	H					C	Mammary	OR
Strontium	7440-24-6									
Styrene	100-42-5									
Sulfide	18496-25-8									
1,2,4,5-Tetrachlorobenzene	95-94-3									
1,1,1,2-Tetrachloroethane	630-20-6	2.60E-02	I			2.60E-02	I	C	Liver	I
1,1,2,2-Tetrachloroethane	79-34-5	2.00E-01	I	5.80E-05	I	2.03E-01	I	C	Liver	I
Tetrachloroethene	127-18-4	5.40E-01	O			2.00E-02	O	B2	Non-Hodgkin's lymphoma	R
2,3,4,6-Tetrachlorophenol	58-90-2									
Thallium	7440-28-0									
Tin	7440-31-5									
Titanium	7440-32-6									
Toluene	108-88-3							D	NC	I
Toxaphene	8001-35-2	1.10E+00	I	3.20E-04	I	1.12E+00	I	B2	Liver and thyroid gland	I
1,2,4-Trichlorobenzene	120-82-1							D	NC	I
1,1,1-Trichloroethane	71-55-6							D	NC	I

Table 5.2 Nonradiological Cancer Slope Factors, Weight of Evidence and Target Organs

Analyte List	CAS Number	Oral/Ingestion Slope Factor (mg/kg-day)$^{-1}$	Source	Inhalation Unit Risk (m^3/µg)	Source	Inhalation Slope Factor (mg/kg-day)$^{-1}$	Source	Weight of Evidence	Target Organ/Cancer	Source
1,1,2-Trichloroethane	79-00-5	5.70E-02	I	1.60E-05	I	5.60E-02	I	C	Liver and thyroid gland	I
Trichloroethene	79-01-6	1.10E-02	P1			6.00E-03	P1		Liver and biliary tract	R
Trichloroethene[b]	79-01-6	4.00E-01	P			4.00E-01	P		Liver and biliary tract	R
Trichlorofluoromethane	75-69-4									
2,4,5-Trichlorophenol	95-95-4									
2,4,6-Trichlorophenol	88-06-2	1.10E-02	I	3.10E-06	I	1.09E-02	I	B2	Leukemia	I
Trichlorophenoxyproprionic acid	93-72-1							D		I
1,2,3-Trichloropropane	96-18-4	2.00E+00	P					B2	Multiple sites	OR
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1									
2,4,6-Trinitrotoluene	118-96-7	3.00E-02	I					C	Bladder	I
Uranium (soluble salts)	7440-61-1									
Vanadium	7440-62-2									
Vinyl acetate	108-05-4									
Vinyl chloride	75-01-4	1.50E+00	I	8.80E-06	I	3.08E-02	I	A	Systemic	I
Xylene (total)	1330-20-7									
p-Xylene	106-42-3									
m-p-Xylene	136777-61-2									
m-Xylene	108-38-3									
o-Xylene	95-47-6									
Zinc	7440-66-6							D	NC	I
Notes:										
a = See Table 5.1 for definitions of Weight of Evidence classifications.										
b = Values recommended by CDPHE. PRGs calculated with these values will be used for CRA screening of COCs.										
I = IRIS (EPA 2004a) H = HEAST (EPA 1997a) A = HEAST Alternate W = Withdrawn from IRIS or HEAST O = EPA Region 3 PRGs (EPA 2004a), source not cited										
A = Agency for Toxic Substances and Disease Registry online database, http://www.atsdr.cdc.gov										
Ai = Human carcinogen by oral route.										
Do = Not classifiable as to human carcinogenicity by oral route.										
NC = Effects not classifiable.										
NOE = No observable effect										
OR = Oakridge National Laboratory, Toxicity Metadata, http://rais.ornl.gov/tox/metadata.shtml										
P = EPA-NCEA provisional value (EPA 2004)										

Table 5.2 Nonradiological Cancer Slope Factors, Weight of Evidence and Target Organs

Analyte List	CAS Number	Oral/Ingestion Slope Factor $(mg/kg\text{-}day)^{-1}$	Source	Inhalation Unit Risk $(m^3/\mu g)$	Source	Inhalation Slope Factor $(mg/kg\text{-}day)^{-1}$	Source	Weight of Evidence	Target Organ/Cancer	Source
PI = 1992 NCEA values recommended by EPA Region 8.										
R = International Agency for the Research of Cancer (IARC) Monographs Database, http://monographs.iarc.fr.										
Ia = Values given are for PCBs.										
Ib = Values given are for Chlordane (CAS no. 12789-03-6).										
Ic = Values given are for 1,3-Dichloropropene (CAS no. 542-75-6).										
Id= Value is for Endosulfan (technical)										
Ie. Endrin was used as a surrogate.										
If. Hexachlorodibenzo-p-dioxin - mixture (CAS 19408-74-3) was used as a surrogate.										

Table 5.3 Radiological Toxicity Constants

Analyte List	CAS Number	Oral Reference[a] Dose $(mg/kg\text{-}day)^{-1}$	Age-Adjusted[b] Soil Ingestion Oral Slope Factor (risk/pCi)	Adult (age 18-65)[c] Soil Ingestion Oral Slope Factor (risk/pCi)	Water Ingestion Oral Slope Factor (risk/pCi)	Inhalation Slope Factor (risk/pCi)	External Slope Factor (risk/yr/pCi)
Am-241	14596-10-2		2.17E-10	9.1E-11	1.04E-10	2.81E-08	2.76E-08
Cs-137+D	10045-97-3		4.33E-11		3.04E-11	1.19E-11	2.55E-06
Np-237	013994-20-2		1.46E-10		6.18E-11	1.77E-08	5.36E-08
Pu-236	015411-92-4		1.74E-10		7.47E-11	2.28E-08	1.19E-10
Pu-238	013981-16-3		2.72E-10		1.31E-10	3.36E-08	7.22E-11
Pu-239	15117-48-3		2.76E-10	1.21E-10	1.35E-10	3.33E-08	2.00E-10
Pu-240	14119-33-6		2.77E-10	1.21E-10	1.35E-10	3.33E-08	6.98E-11
Ra-226	13982-63-3		7.29E-10		3.85E-10	1.15E-08	2.29E-08
Ra-228+D	15262-20-1		2.29E-09		1.04E-09	5.23E-09	4.53E-06
Sr-89	14158-27-1		3.47E-11		1.28E-11	2.34E-11	7.19E-09
Sr-90+D	10098-97-2		9.53E-11		7.4E-11	1.13E-10	1.96E-08
Tritium	10028-17-8		9.25E-14		5.07E-14	5.62E-14	-
U-233	13968-55-3	3.00E-03	1.6E-10		7.18E-11	1.16E-08	9.82E-10
U-234	13966-29-5	3.00E-03	1.58E-10	5.11E-11	7.07E-11	1.14E-08	2.52E-10
U-235	15117-96-1	3.00E-03	1.57E-10	4.92E-11	6.96E-11	1.01E-08	5.18E-07
U-238	7440-61-1	3.00E-03	1.43E-10	4.66E-11	6.4E-11	9.32E-09	4.99E-11

a = Values from IRIS (EPA 2004a)
b = Values from HEAST for Radionuclides (EPA 2001a)
c = Values Derived for RSALS (EPA et al. 2002)

5.2 Identification of Toxicity Values for Noncarcinogenic Effects

Potential noncarcinogenic effects will be evaluated in the risk characterization by comparing daily intakes (calculated in the exposure assessment) with chronic reference doses (RfDs) developed by EPA. A chronic RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of the daily exposure that can be incurred during a lifetime without an appreciable risk of a noncarcinogenic effect being incurred in human populations, including sensitive subgroups (EPA 1989). The RfD is based on the assumption that thresholds exist for noncarcinogenic toxic effects (for example, liver or kidney damage). Adverse effects are not expected to occur with chronic daily intakes below the RfD value.

Conversely, if chronic daily intakes exceed this threshold level, there is a potential that some adverse noncarcinogenic health effects might be observed in exposed individuals.

Table 5.4 lists the current values used for calculation of PRGs. The observed effects are also listed. These values will be used in the CRA hazard characterization. A similar table of values will be included in the CRA for COCs.

5.3 Dermal Exposure to Chemicals

Because intake from dermal contact is estimated as an absorbed dose, EPA recommends using oral toxicity factors, adjusted if possible by a gastrointestinal absorption fraction, to evaluate toxic effects from dermal contact with potentially contaminated media (EPA 1989, 1992c, 2001b). The oral toxicity factor relates the toxic response to an administered intake dose of contaminant, which may be only partially absorbed by the body. When specific gastrointestinal absorption rates are not available, gastrointestinal absorption is assumed to be 100 percent and the unadjusted oral toxicity factor is used to assess the response to dermal absorption. Adjustments will be made to the oral toxicity factors in Tables 5.2 and 5.3 for assessing dermal exposures in the CRA. The values for the adjusted factors and the rationale will be presented in the CRA.

5.4 Identification of Radionuclide Dose Conversion Factors

Dose coefficients will be delineated according to federal guidance (EPA 1988, 1993). Dose coefficients will be tabulated for the committed effective dose equivalent to tissues of the body per unit activity of inhaled or ingested radionuclides. The guidelines were derived to be consistent with current federal radiation protection guidance. The guidelines are intended to serve as the basis for setting upper bounds on the inhalation and ingestion of, and submersion in, radioactive materials in the workplace. The guidance also includes tables of exposure-to-dose conversion factors for general use in assessing average individual committed doses in any population adequately characterized by "Reference Man" (ICRP 1975).

Table 5.4 Noncarcinogenic Reference Values, Target Organs and Effects

Analyte List	CAS Number	Oral RfD (mg/kg-day)		Inhalation RfC (mg/m^3)		Inhalation RfD (mg/kg-day)		Fraction Absorbed[a]	Organ/Effect	Source
Acenaphthene	83-32-9	6.00E-02	I					1.30E-01	Liver toxicity	I
Acenaphthylene	208-96-8							1.30E-01	Liver toxicity	I
Acetone	67-64-1	9.00E-01	I					1.00E-01	Kidney toxicity	I
Acrolein	107-02-8	5.00E-04	I	2.00E-05	I	5.71E-06	I	1.00E-01	Decreased survival	I
Acrylonitrile	107-13-1	1.00E-03	H	2.00E-03	I	5.71E-04	I	1.00E-01	Nasal respiratory epithelium; mucous secreting cells	I
Alachlor	15972-60-8	1.00E-02	I					1.00E-01	Blood	I
Aldicarb	116-06-3	1.00E-03	I					1.00E-01	ACheiand acetylcholinesterase inhibition	I
Aldicarb sulfone	1646-88-4	1.00E-03	I					1.00E-01	Brain ChE inhibition	I
Aldicarb sulfoxide	1646-87-3							1.00E-01		
Aldrin	309-00-2	3.00E-05	I					1.00E-01	Liver toxicity	I
Aluminum	7429-90-5	1.00E+00	P	3.50E-03	P	1.00E-03	P		Bone	A
Ammonium (as ammonia)	7664-41-7			1.00E-01	I	2.86E-02			Increase of rhinitis and pneumonia with respiratory lesions	I
Anthracene	120-12-7	3.00E-01	I					1.30E-01	No observed effects	I
Antimony	7440-36-0	4.00E-04	I						Longevity, blood glucose, and cholesterol	I
Aroclor 1016	12674-11-2	7.00E-05	I					1.40E-01	Reduced birth weights	I
Aroclor 1221	11104-28-2							1.40E-01		
Aroclor 1232	11141-16-5							1.40E-01		
Aroclor 1242	53469-21-9							1.40E-01		
Aroclor 1248	12672-29-6							1.40E-01		
Aroclor 1254	11097-69-1	2.00E-05	I					1.40E-01	Eyes, finger and toe nails; decreased antibodies	I
Aroclor 1260	11096-82-5							1.40E-01		
Arsenic	7440-38-2	3.00E-04	I					3.00E-02	Hyperpigmentation, keratosis and vascular complications	I
Atrazine	1912-24-9	3.50E-02	I					1.00E-01	Decreased body weight, cardiac toxicity	I
Barium	7440-39-3	7.00E-02	I	5.00E-04	A	1.43E-04	A		Increased kidney weight.	I
Benzene	71-43-2	4.00E-03	I	3.00E-02	I	8.57E-03	I		Decreased lymphocyte count	I
Benzidine	92-87-5	3.00E-03	I					1.00E-01		
Benzo(a)anthracene	56-55-3							1.30E-01		

Table 5.4 Noncarcinogenic Reference Values, Target Organs and Effects

Analyte List	CAS Number	Oral RfD (mg/kg-day)		Inhalation RfC (mg/m^3)		Inhalation RfD (mg/kg-day)		Fraction Absorbed[a]	Organ/Effect	Source
Benzo(a)pyrene	50-32-8							1.30E-01		
Benzo(b)fluoranthene	205-99-2							1.30E-01		
Benzo(g,h,i)perylene	191-24-2							1.30E-01		
Benzo(k)fluoranthene	207-08-9							1.30E-01		
Benzoic Acid (at pH 7)	65-85-0	4.00E+00	I					1.00E-01	No adverse effects observed	I
Benzyl Alcohol	100-51-6	3.00E-01	H					1.00E-01	Stomach, epithelial hyperplasia	
Beryllium	7440-41-7	2.00E-03	I	2.00E-05	I	5.71E-06	I		Small intestines, lungs	I
bis(2-chloroethyl)ether	111-44-4							1.00E-01	Decreased hemoglobin/ erythrocyte destruction	I
bis(2-chloroisopropyl)ether	108-60-1	4.00E-02	I					1.00E-01	Decreased hemoglobin/ erythrocyte destruction	I
bis(2-ethylhexyl)phthalate	117-81-7	2.00E-02	I					1.00E-01	Increased liver weight	I
Boron	7440-42-8	9.00E-02	I			5.70E-03	H		Testicular atrophy, spermatogenic arrest	I
Bromodichloromethane	75-27-4	2.00E-02	I					1.00E-01	Liver and kidneys	A
Bromoform	75-25-2	2.00E-02	I					1.00E-01	Liver	I
Bromomethane (methyl bromide)	74-83-9	1.40E-03	I	5.00E-03	I	1.43E-03	I	1.00E-01	Forestomach, lesions of the olfactory epithelium	I
2-Butanone (methyl ethyl ketone)	78-93-3	6.00E-01	I	5.00E+00	I	1.43E+00	I	1.00E-01	Decreased birthweight, skeletal variations	I
Butylbenzylphthalate	85-68-7	2.00E-01	I					1.00E-01	Increased liver-to-body and liver-to-brain weight ratios	I
Cadmium (food)	7440-43-9	1.00E-03	I	2.00E-04	P	5.70E-05	P	1.00E-03	Proteinuria	I
Cadmium (water)	7440-43-9	5.00E-04	I	2.00E-04	P	5.70E-05	P		Proteinuria	I
Carbazole	86-74-8							1.00E-01		
Carbofuran	1563-66-2	5.00E-03	I					1.00E-01	Cholinesterase inhibition, and testicular and uterine effects	I
Carbon disulfide	75-15-0	1.00E-01	I	7.00E-01	I	2.00E-01	I	1.00E-01	Fetal toxicity/malformations/nervous system dysfunction	I
Carbon tetrachloride	56-23-5	7.00E-04	I	2.00E-03	P	5.71E-04	P	1.00E-01	Liver lesions	I
Chlordane-alpha	5103-71-9	5.00E-04	Ia	7.00E-04	Ia	2.00E-04	Ia	4.00E-02	Hepatic necrosis	I
Chlordane-beta	5103-74-2	5.00E-04	Ia	7.00E-04	Ia	2.00E-04	Ia	4.00E-02	Hepatic necrosis	I
Chlordane-gamma	12789-03-6	5.00E-04	Ia	7.00E-04	Ia	2.00E-04	Ia	4.00E-02	Hepatic necrosis	I
4-Chloroaniline	106-47-8	4.00E-03	I					1.00E-01	Nonneoplastic lesions of splenic capsule	I
Chlorobenzene	108-90-7	2.00E-02	I	5.95E-02	P	1.70E-02	P	1.00E-01	Histopathologic changes in liver	I

66

Table 5.4 Noncarcinogenic Reference Values, Target Organs and Effects

Analyte List	CAS Number	Oral RfD (mg/kg-day)		Inhalation RfC (mg/m³)		Inhalation RfD (mg/kg-day)		Fraction Absorbed[a]	Organ/Effect	Source
Chloroethane (ethyl chloride)	75-00-3	4.00E-01	P	1.00E+01	I	2.86E+00	I	1.00E-01	Delayed fetal ossification	I
Chloroform	67-66-3	1.00E-02	I	4.90E-02	P	1.40E-02	P	1.00E-01	Fatty cyst formation in the liver and elevated SGPT	I
Chloromethane (methyl chloride)	74-87-3			9.00E-02	I	2.57E-02	I	1.00E-01	Cerebellar lesions	I
4-Chloro-3-methylphenol	59-50-7							1.00E-01		
2-Chloronaphthalene	91-58-7	8.00E-02	I					1.00E-01	Dyspnea, abnormal appearance, liver enlargement	I
2-Chlorophenol	95-57-8	5.00E-03	I					1.00E-01	Reproductive effects	I
Chlorpyrifos	2921-88-2	3.00E-03	I					1.00E-01	Decreased plasma ChE	I
Chromium III	16065-83-1	1.50E+00	I						No effects observed	I
Chromium VI	18540-29-9	3.00E-03	I	1.00E-04	I	2.86E-05	I		Nasal septum atrophy	I
Chrysene	218-01-9							1.30E-01		
Cobalt	7440-48-4	2.00E-02	P			5.70E-06	P		Lung and heart effects	A
Copper	7440-50-8	4.00E-02	H						Liver and kidney damage	A
Cyanide	57-12-5	2.00E-02	I						Weight loss, thyroid effects and myelin degeneration	I
Cyclohexane	110-82-7			6.00E+00	I	1.71E+00	I	1.00E-01	Developmental effects	I
4,4-DDD	72-54-8							3.00E-02		
4,4-DDE	72-55-9							3.00E-02		
4,4-DDT	50-29-3	5.00E-04	I					3.00E-02	Liver lesions	I
Dalapon	75-99-0	3.00E-02	I					1.00E-01	Kidney effects	A
Demeton	8065-48-3	4.00E-05	I					1.00E-01	Brain, optic nerve	I
Dibenzo(a,h)anthracene	53-70-3							1.30E-01		
Dibenzofuran	132-64-9	2.00E-03	P					1.00E-01	Kidney lesions	
Dibromochloromethane	124-48-1	2.00E-02	I					1.00E-01	Hepatic lesions	I
1,2-Dibromo-3-chloropropane	96-12-8			2.00E-04	I	5.71E-05	I	1.00E-01	Testicular effects	I
Dicamba	1918-00-9	3.00E-02	I					1.00E-01	Maternal and fetal toxicity	I
1,2-Dichlorobenzene (o-)	95-50-1	9.00E-02	I	1.40E-01	H	4.00E-02	H	1.00E-01	No adverse effects observed, decreased weight gain	I
1,3-Dichlorobenzene	541-73-1	3.00E-02	P					1.00E-01		
1,4-Dichlorobenzene (p-)	106-46-7	3.00E-02	P	8.00E-01	I	2.29E-01	I	1.00E-01	Increased liver weights	I

Table 5.4 Noncarcinogenic Reference Values, Target Organs and Effects

Analyte List	CAS Number	Oral RfD (mg/kg-day)		Inhalation RfC (mg/m³)		Inhalation RfD (mg/kg-day)		Fraction Absorbed[a]	Organ/Effect	Source
3,3-Dichlorobenzidine	91-94-1							1.00E-01		
Dichlorodifluoromethane	75-71-8	2.00E-01	I			5.00E-02	A	1.00E-01	Decreased body weight	I
1,1-Dichloroethane	75-34-3	1.00E-01	H			1.40E-01	A	1.00E-01		
1,2-Dichloroethane	107-06-2	2.00E-02	P	5.00E-03	P	1.40E-03	P	1.00E-01		
1,1-Dichloroethene	75-35-4	5.00E-02	I	2.00E-01	I	5.71E-02	I	1.00E-01	Liver toxicity	I
1,1-Dichloroethene[b]	75-35-4	5.00E-02	I	5.00E-03	S	1.43E-02	S	1.00E-01	Liver toxicity	
1,2-Dichloroethene (total)	540-59-0	9.00E-03	H					1.00E-01	Liver, kidneys, and lungs	A
2,4-Dichlorophenol	120-83-2	3.00E-03	I					1.00E-01	Decreased delayed hypersensitivity response	I
Dichlorophenoxyacetic acid (2,4-D)	94-75-7	1.00E-02	I					5.00E-02	Hematologic, hepatic and renal toxicity	I
4-(2,4-Dichlorophenoxy) butyric acid (2,4-DB)	94-82-6	8.00E-03	I					1.00E-01	Internal hemorrhages	I
1,2-Dichloropropane	78-87-5			4.00E-03	I	1.14E-03	I	1.00E-01	Hyperplasia of the nasal mucosa	I
1,3-Dichloropropene	542-75-6	3.00E-02	I	2.00E-02	I	5.71E-03	I	1.00E-01	Hypertrophy/hyperplasia of the nasal epithelium	I
cis-1,3-Dichloropropene	10061-01-5	3.00E-02	Ib	2.00E-02	Ib	5.71E-03	Ib	1.00E-01	Hypertrophy/hyperplasia of the nasal epithelium	
trans-1,3-Dichloropropene	10061-02-6	3.00E-02	Ib	2.00E-02	Ib	5.71E-03	Ib	1.00E-01	Hypertrophy/hyperplasia of the nasal epithelium	
Dieldrin	60-57-1	5.00E-05	I					1.00E-01	Liver lesions	I
Diethyl ether	60-29-7	2.00E-01	I					1.00E-01	Decreased body weight	I
Di(2-ethylhexyl)adipate	103-23-1	6.00E-01	I					1.00E-01	Changes in body and liver weight	I
Diethylphthalate	84-66-2	8.00E-01	I					1.00E-01	Decreased growth, food consumption, and organ weights	I
Dimethoate	60-51-5	2.00E-04	I					1.00E-01	Brain	I
2,4-Dimethylphenol	105-67-9	2.00E-02	I					1.00E-01	Lethargy, prostration, ataxia, and liver changes	I
Dimethylphthalate	131-11-3	1.00E+01	W					1.00E-01		
Di-n-butylphthalate	84-74-2	1.00E-01	I					1.00E-01	Increased mortality	I
4,6-Dinitro-2-methylphenol (4,6-dinitro-o-cresol)	534-52-1	1.00E-04	P					1.00E-01	Eye	
2,4-Dinitrophenol	51-28-5	2.00E-03	I					1.00E-01	Cataract formation	I
2,4-Dinitrotoluene	121-14-2	2.00E-03	I					1.00E-01	Neurotoxicity, Heinz bodies and biliary tract hyperplasia	I
2,6-Dinitrotoluene	606-20-2	1.00E-03	H					1.00E-01	Whole body, mortality	
Di-n-octylphthalate	117-84-0	4.00E-02	P					1.00E-01		

Table 5.4 Noncarcinogenic Reference Values, Target Organs and Effects

Analyte List	CAS Number	Oral RfD (mg/kg-day)		Inhalation RfC (mg/m³)		Inhalation RfD (mg/kg-day)		Fraction Absorbed[a]	Organ/Effect	Source
Dinoseb	88-85-7	1.00E-03	I					1.00E-01	Decreased fetal weight	I
1,4-Dioxane	123-91-1							3.00E-02		
Dioxin (2,3,7,8-TCDD)	1746-01-6							3.00E-02		
1,2-Diphenylhydrazine	122-66-7							1.00E-01		
Diquat	85-00-7	2.20E-03	I					1.00E-01	Minimal lens opacity and cataracts	I
Endosulfan I	959-98-8	6.00E-03	Ic					1.00E-01	Reduced body weight and neurologic findings	
Endosulfan II	33213-65-9	6.00E-03	Ic					1.00E-01	Reduced body weight and neurologic findings	
Endosulfan sulfate	1031-07-8	6.00E-03	Ic					1.00E-01	Reduced body weight and neurologic findings	
Endosulfan (technical)	115-29-7	6.00E-03	I					1.00E-01	Reduced body weight and neurologic findings	I
Endrin (technical)	72-20-8	3.00E-04	I					1.00E-01	Lesions in liver, occasional convulsions	I
Endrin aldehyde	7421-93-4	3.00E-04	Id					1.00E-01	Lesions in liver, occasional convulsions	
Endrin ketone	53494-70-5	3.00E-04	Id					1.00E-01	Lesions in liver, occasional convulsions	
Ethyl acetate	141-78-6	9.00E-01	I					1.00E-01	Mortality	I
Ethylbenzene	100-41-4	1.00E-01	I	1.00E+00	I	2.86E-01	I	1.00E-01	Liver and kidney toxicity	I
Ethylene dibromide [1,2-Dibromoethane]	106-93-4			2.00E-04	H	5.70E-05	H	1.30E-01	Sperm	
Fluoranthene	206-44-0	4.00E-02	I					1.00E-01	Kidneys/liver	I
Fluorene	86-73-7	4.00E-02	I					1.30E-01	Blood	I
Fluoride (as fluorine)	7782-41-4	6.00E-02	I					1.00E-01	Objectionable dental fluorosis, a cosmetic effect	I
Glyphosate	1071-83-6	1.00E-01	I					1.00E-01	Increased incidence of renal tubular dilation	I
Guthion	86-50-0							1.00E-01		
Heptachlor	76-44-8	5.00E-04	I					1.00E-01	Increased liver weight	I
Heptachlor epoxide	1024-57-3	1.30E-05	I					1.00E-01	Increased liver weight	I
Hexachlorobenzene	118-74-1	8.00E-04	I					1.00E-01	Liver effects	I
Hexachlorobutadiene	87-68-3	2.00E-04	H					4.00E-02	Kidney and liver damage	A
Hexachlorocyclohexane, alpha	319-84-6							4.00E-02		
Hexachlorocyclohexane, beta	319-85-7							4.00E-02		
Hexachlorocyclohexane, delta	319-86-8							4.00E-02		

Table 5.4 Noncarcinogenic Reference Values, Target Organs and Effects

Analyte List	CAS Number	Oral RfD (mg/kg-day)		Inhalation RfC (mg/m^3)		Inhalation RfD (mg/kg-day)		Fraction Absorbed	Organ/Effect	Source
Hexachlorocyclohexane, gamma (Lindane)	58-89-9	3.00E-04	I					4.00E-02	Liver and kidney toxicity	I
Hexachlorocyclohexane (technical)	608-73-1							1.00E-01		
Hexachlorocyclopentadiene	77-47-4	6.00E-03	I	2.00E-04	I	5.71E-05	I	1.00E-01	Irritation and inflammation	I
Hexachlorodibenzo-p-dioxin (mix)	34465-46-8							3.00E-02		
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7							3.00E-02		
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3							3.00E-02		
Hexachloroethane	67-72-1	1.00E-03	I					1.00E-01	Atrophy and degeneration of the renal tubules	I
Indeno(1,2,3-cd)pyrene	193-39-5							1.30E-01		
Iron	7439-89-6	3.00E-01	P					1.00E-01		
Isobutyl alcohol	78-83-1	3.00E-01	I					1.00E-01	Hypoactivity and ataxia	I
Isophorone	78-59-1	2.00E-01	I					1.00E-01	No observed effects	I
Isopropylbenzene (cumene)	98-82-8	1.00E-01	I	4.00E-01	I	1.14E-01	I	1.00E-01	Kidneys	I
Lead	7439-92-1									
Lithium	7439-93-2	2.00E-02	P							
Manganese (food)	7439-96-5	1.40E-01	I	5.00E-05	I	1.43E-05	I		CNS effects	I
Mercury	7439-97-6	3.00E-03	I	3.00E-04	I	8.57E-05	I		CNS effects	I
Methoxychlor	72-43-5	5.00E-03	I					1.00E-01	Increase in loss of litters	I
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	94-74-6	5.00E-04	I					1.00E-01	Liver and kidneys	I
2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	93-65-2	1.00E-03	I					1.00E-01	Kidneys	I
Methylene chloride (dichloromethane)	75-09-2	6.00E-02	I	3.00E+00	H	8.57E-01	H	1.00E-01	Liver toxicity	I
Methyl methacrylate	80-62-6	1.40E+00	I	7.00E-01	I	2.00E-01	I	1.00E-01	Olfactory epithelium	I
2-Methylnaphthalene	91-57-6	4.00E-03	P					1.00E-01	Ear function	I
4-Methyl-2-pentanone (methyl isobutyl ketone)	108-10-1			3.00E+00	I	8.57E-01	I	1.00E-01	Reduced fetal body weight/skeletal variations/increased fetal death	I
2-Methylphenol (o-cresol)	95-48-7	5.00E-02	I					1.00E-01	Decreased body weights and neurotoxicity	I
4-Methylphenol (p-cresol)	106-44-5	5.00E-03	H					1.00E-01		

Table 5.4 Noncarcinogenic Reference Values, Target Organs and Effects

Analyte List	CAS Number	Oral RfD (mg/kg-day)		Inhalation RfC (mg/m³)		Inhalation RfD (mg/kg-day)		Fraction Absorbed[a]	Organ/Effect	Source
Methyl tert-butyl ether	1634-04-4			3.00E+00	I	8.57E-01	I	1.00E-01	Liver and kidneys	I
Mirex	2385-85-5	2.00E-04	I					1.00E-01	Liver, thyroid	I
Molybdenum	7439-98-7	5.00E-03	I					1.00E-01	Increased uric acid levels	I
Naphthalene	91-20-3	2.00E-02	I	3.00E-03	I	8.57E-04	I	1.30E-01	Decreased terminal body weight/nasal effects	I
Nickel (soluble)	7440-02-0	2.00E-02	I					1.00E-01	Decreased body and organ weights	I
Nitrate	14797-55-8	1.60E+00	I						Methemoglobinemia	I
Nitrite	14797-65-0	1.00E-01	I						Methemoglobinemia	I
2-Nitroaniline	88-74-4	3.00E-03	P	1.05E-04	P	3.00E-05	P	1.00E-01	Blood, methemoglobinemia	OR
4-Nitroanaline	100-01-6	3.00E-03	P	3.50E-03	P	1.00E-03	P		Spleen	OR
Nitrobenzene	98-95-3	5.00E-04	I	2.10E-03	A	6.00E-04	A	1.00E-01	Liver, adrenal, kidney lesions	I
2-Nitrophenol	88-75-5							1.00E-01		
4-Nitrophenol	100-02-7	8.00E-03	P					1.00E-01		
N-Nitroso-di-n-butylamine	924-16-3							1.00E-01		
N-Nitrosodiethylamine	55-18-5							1.00E-01		OR
N-Nitrosodimethylamine	62-75-9	8.00E-06	P					1.00E-01	Liver effects	A
N-Nitrosodiphenylamine	86-30-6	2.00E-02	P					1.00E-01	Eye, corneal opacity	
N-Nitrosodi-N-propylamine	621-64-7							1.00E-01		
N-Nitrosopyrrolidine	930-55-2							1.00E-01		
p-Nirotoluene	99-99-0	1.00E-02	P					1.00E-01	Spleen, lesions	OR
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	5.00E-02	I					1.00E-01	Liver	I
Oxamyl (vydate)	23135-22-0	2.50E-02	I					1.00E-01	Decreased body weight gain and food consumption	I
Parathion	56-38-2	6.00E-03	H					1.00E-01	Decreased cholinesterase	OR
Pentachlorobenzene	608-93-5	8.40E-04	I					2.50E-01	Liver and kidney toxicity	I
Pentachlorophenol	87-86-5	3.00E-02	I					1.30E-01	Liver and kidneys	I
Phenanthrene	85-01-8							1.00E-01		
Phenol	108-95-2	3.00E-01	I					1.30E-01	Decreased maternal weight gain	I
Picloram	1918-02-1	7.00E-02	I					1.30E-01	Increased liver weights	I

Table 5.4 Noncarcinogenic Reference Values, Target Organs and Effects

Analyte List	CAS Number	Oral RfD (mg/kg-day)		Inhalation RfC (mg/m^3)		Inhalation RfD (mg/kg-day)		Fraction Absorbed[a]	Organ/Effect	Source
Pyrene	129-00-0	3.00E-02	I					1.30E-01	Kidneys	I
Selenium	7782-49-2	5.00E-03	I						Selenosis	I
Silver	7440-22-4	5.00E-03	I						Argyria	I
Simazine	122-34-9	5.00E-03	I						Reduced weight; Liver changes in females	I
Strontium	7440-24-6	6.00E-01	I						Rachitic bone	I
Styrene	100-42-5	2.00E-01	I	1.00E+00	I	2.86E-01	I	1.00E-01	Red blood cell, liver, and CNS effects	I
Sulfide	18496-25-8									
1,2,4,5-Tetrachlorobenzene	95-94-3	3.00E-04	I					1.00E-01	Kidney lesions	I
1,1,1,2-Tetrachloroethane	630-20-6	3.00E-02	I					1.00E-01	Liver and kidneys	I
1,1,2,2-Tetrachloroethane	79-34-5	6.00E-02	P					1.00E-01	Liver, vacuolization	OR
Tetrachloroethene	127-18-4	1.00E-02	I	4.90E-01	P	1.40E-01	P	1.00E-01	Liver toxicity, weight gain	I
2,3,4,6-Tetrachlorophenol	58-90-2	3.00E-02	I					1.00E-01	Liver	I
Thallium	7440-28-0	7.00E-05	I						Nervous system effects	A
Tin	7440-31-5	6.00E-01	H						Liver lesions	OR
Titanium	7440-32-6	4.00E+00	P	3.01E-02	P	8.60E-03	P			
Toluene	108-88-3	2.00E-01	I	4.00E-01	I	1.14E-01	I	1.00E-01	Liver and kidney weights, nasal epithelium, CNS effects	I
Toxaphene	8001-35-2							1.00E-01		
1,2,4-Trichlorobenzene	120-82-1	1.00E-02	I	3.50E-03	P	1.00E-03	P	1.00E-01	Increased adrenal weights; vacuolization in the cortex	I
1,1,1-Trichloroethane	71-55-6	2.80E-01	P	2.21E+00	P	6.30E-01	P	1.00E-01		
1,1,2-Trichloroethane	79-00-5	4.00E-03	I					1.00E-01	Changed serum chemistry	I
Trichloroethene	79-01-6	3.00E-04	P					1.00E-01	CNS, liver, endocrine system, fetus	OR
Trichloroethene[b]	79-01-6	3.00E-04	P	3.50E-02	P	1.00E-02	P	1.00E-01	CNS, liver, endocrine system, fetus	OR
Trichlorofluoromethane	75-69-4	3.00E-01	I	7.00E-01	A	2.00E-01	A	1.00E-01	Histopathology	I
2,4,5-Trichlorophenol	95-95-4	1.00E-01	I					1.00E-01	Liver and kidneys	I
2,4,6-Trichlorophenol	88-06-2							1.00E-01		
Trichlorophenoxyproprionic acid	93-72-1	8.00E-03	I					1.00E-01	Liver	I
1,2,3-Trichloropropane	96-18-4	6.00E-03	I			1.40E-03	P	1.00E-01	Blood	I

Table 5.4 Noncarcinogenic Reference Values, Target Organs and Effects

Analyte List	CAS Number	Oral RfD (mg/kg-day)		Inhalation RfC (mg/m^3)		Inhalation RfD (mg/kg-day)		Fraction Absorbed[a]	Organ/Effect	Source
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	3.00E-01	I			8.60E+00	H	1.00E-01	Psychomotor impairment	I
2,4,6-Trinitrotoluene	118-96-7	5.00E-04	I					1.00E-01	Liver	I
Uranium (soluble salts)	7440-61-1	3.00E-03	I						Moderate ephrotoxicity	I
Vanadium	7440-62-2	1.00E-03	P						Decreased hair cystine	OR
Vinyl acetate	108-05-4	1.00E+00	H	2.00E-01	I	5.71E-02	I	1.00E-01	Nasal epithelial lesions	I
Vinyl chloride	75-01-4	3.00E-03	I	1.00E-01	I	2.86E-02	I	1.00E-01	Liver cell polymorphism	I
Xylene (total)	1330-20-7	2.00E-01	I	1.00E-01	I	2.86E-02	I	1.00E-01	Decreased body weight/increased mortality/CNS effects	I
p-Xylene	106-42-3	2.00E-01	I	1.00E-01	I	5.71E-02	I	1.00E-01	Decreased body weight/increased mortality/CNS effects	I
m-p-Xylene	136777-61-2	2.00E-01	I	1.00E-01	I	5.71E-02	I	1.00E-01	Decreased body weight/increased mortality/CNS effects	I
m-Xylene	108-38-3	2.00E-01	I	1.00E-01	I	5.71E-02	I	1.00E-01	Decreased body weight/increased mortality/CNS effects	I
o-Xylene	95-47-6	2.00E-01	I	1.00E-01	I	5.71E-02	I	1.00E-01	Decreased body weight/increased mortality/CNS effects	I
Zinc	7440-66-6	3.00E-01	I						Decrease in ESOD concentration	I
Notes:										
a = Dermal ABS from EPA 2001.										
b = Values recommended by CDPHE, PRGs calculated with these values will be used for screening of COCs.										
I = IRIS (EPA 2004) H = HEAST (EPA 1997) A = HEAST Alternate W = Withdrawn from IRIS or HEAST										
P = EPA-NCEA provisional value (EPA 2003)										
E1 = 1992 NCEA values recommended by EPA Region 8.										
O = EPA Region 3 PRGs (EPA 2003), source not cited										
S = CDPHE value										
Ia = Values given are for Chlordane (CAS no. 12789-03-6).										
Ib = Values given are for 1,3-Dichloropropene (CAS no. 542-75-6).										
Ic = Value is for Endosulfan (technical)										
Id= Endrin was used as a surrogate.										
ESOD = Erythrocyte superoxide dismutase										

The dose coefficients for external exposure to radionuclides distributed in air, water, and soil will be tabulated in accordance with Federal Guidance Reports Nos. 11 and 12 (EPA 1988, 1993). The dose coefficients are based on dosimetric methodologies and include the results of calculations of the energy and angular distributions of the radiations incident upon the body and transport of these radiations within the body. Particular effort was devoted to expanding the information available for the assessment of the radiation dose from radionuclides distributed on or below the ground surface.

Dose coefficients for external exposure relate the doses to organs and tissues to the concentrations of radionuclides in environmental media. This is referred to as "external exposure," because the radiations arise outside the body. Intakes of radionuclides may also be by inhalation or ingestion, where the radiations are emitted inside the body. In either case, the dosimetric quantities of interest are the radiation dose received by the more radiosensitive organs and tissues of the body. Radiations of concern for external exposures are those that are sufficiently penetrating to traverse the overlying tissues of the body and deposit ionizing energy in radiosensitive organs and tissues. Penetrating radiations are limited to photons, including bremsstrahlung, and electrons. The radiation dose depends on the temporal and spatial distributions of the radionuclide to which a human is exposed. The mode considered for the CRA for external exposure is exposure to contamination on or in the ground.

6.0 HUMAN HEALTH RISK CHARACTERIZATION

Actions: Characterize risks for the CRA for two receptors:

1. Risk to an on-site WRW will be assessed based on exposure to COCs developed on the basis of the EUs, as discussed in Section 4.2.
2. Risk to an on-site WRV will be assessed based on exposure to COCs developed on the basis of the same EUs.

To characterize risks, the chemical-specific intakes calculated in the exposure assessment are multiplied by the applicable chemical-specific dose-response factors to compute estimates of the cancer risk for an individual over a lifetime of exposure. Alternately, the intakes are compared with RfDs (chronic, subchronic, or acute) for noncarcinogenic health effects. The nature, WOE, and magnitude of uncertainty for the potential critical health effects are considered. The process of quantifying health risks includes the following:

- Calculating and characterizing carcinogenic effects for each applicable COC, receptor, pathway, and exposure scenario, using both Tier 1 and Tier 2 EPCs;
- Calculating and characterizing noncarcinogenic effects for each COC, receptor, pathway, and exposure scenario, using both Tier 1 and Tier 2 EPCs;
- Calculating and characterizing the dermal exposure effects;
- Calculating and characterizing radiation dose for each radionuclide COC, receptor, pathway, and exposure scenario, using both Tier 1 and Tier 2 EPCs; and
- Conducting qualitative (or quantitative, if necessary) uncertainty analysis.

13

6.1 Calculating and Characterizing Carcinogenic Effects

The following calculation will be used to determine carcinogenic effects by obtaining numeric estimates (that is, unitless probabilities) of lifetime cancer risks:

$$Risk = Intake \times CSF \qquad \text{(Equation 6-1)}$$

Where:

Risk = potential lifetime excess cancer risk (unitless probability)

Intake = chronic daily lifetime intake (mg/kg-day or pCi) from equations in Table 4.7

CSF = cancer slope factor ($[mg/kg\text{-}day]^{-1}$ or pCi^{-1})

CSFs will be used as provided in IRIS (EPA 2004a). Inhalation and oral ingestion CSFs are used with their respective inhalation and ingestion intakes to estimate potential carcinogenic health risks. The CSFs used are presented and discussed in the toxicity assessment (Section 5.1).

Risks calculated for each COC are summed to estimate a total chemical cancer risk ($Risk_{Tc}$) and a total radionuclide cancer risk ($Risk_{Tr}$), using the following equations:

$$Risk_{Tc} = \Sigma Risk_{ic} \qquad \text{(Equation 6-2)}$$
$$Risk_{Tr} = \Sigma Risk_{ir} \qquad \text{(Equation 6-3)}$$

Where:

$Risk_{Tc}$ = total chemical cancer risk (unitless probability)

$Risk_{ic}$ = risk estimate for the ith chemical contaminant (unitless probability)

$Risk_{Tr}$ = total radionuclide cancer risk (unitless probability)

$Risk_{ir}$ = risk estimate for the i^{th} radionuclide contaminant (unitless probability)

These equations are an approximation of the precise equation for combining risks to account for the probability of the same individual developing cancer as a consequence of exposure to two or more carcinogens. The difference between the precise equation and this approximation is negligible for total cancer risks less than 0.1 (10^{-1}). The risk summation assumes independence of action by the compounds (that is, no synergistic or antagonistic actions). The limitations of this approach include conservative risk estimates due to the use of multiple upper-bound estimates of CSFs, increased uncertainty when adding potential carcinogenic risk across WOE cancer classes (A through C), and uncertainty due to possible interactions among carcinogens.

A table of risks for each exposure scenario will be presented to show contaminant- and pathway-specific risk, with contaminants presented by rows and pathways presented by columns. Risks will be subtotaled across pathways for each contaminant.

A total carcinogenic risk will also be summed separately for chemicals and radionuclides across WOE classifications as an aid in the discussion of the uncertainty of the estimates. In

74

accordance with EPA (1989) guidance, only one significant digit is retained when summarizing calculated risks.

The CRA is an assessment of the human health and ecological risks from residual contamination. The pathways and contaminants driving the risk will be noted and accompanied by a discussion of any qualifying information.

In addition to presenting the incremental cancer risks due to contaminants at the Site, perspective may be provided by giving examples of typical background sources of risk, such as for arsenic or uranium. The text will note assumptions associated with the calculations, and discuss the importance of background risks associated with each exposure scenario. The CRA summary section will present risks for each scenario.

6.2 Calculating and Characterizing Noncarcinogenic Effects

Health risks associated with exposure to individual noncarcinogenic compounds are determined by calculating HQs and HIs. The noncarcinogenic HQ is the ratio of the intake or exposure level to the RfD, as follows:

$$HQ_i = Intake_i / RfD_i \qquad \text{(Equation 6-4)}$$

Where:

HQ_i = noncarcinogenic HQ for ith substance

$Intake_i$ = intake for ith substance (mg/kg-day) for appropriate exposure period

RfD_i = RfD for i^{th} substance (mg/kg-day) for appropriate exposure duration

Inhalation and oral ingestion RfDs are used with their respective inhalation and ingestion intakes to estimate potential noncarcinogenic health effects. Intake and RfD are expressed in the same units and represent the same exposure period. The RfDs used are presented and discussed in the toxicity assessment of the CRA. COCs that have been determined to have subchronic (2-week to 7-year exposure) or acute (less than 2-week exposure) effects in the toxicity assessment will be characterized using subchronic or acute RfDs, or other dose-response information, as available.

HIs are the summed HQs for each chemical across an exposure pathway. An HI is calculated using the following equation:

$$HI_{pw} = \sum HQ_i \text{(Equation 6-5)}$$

Where:

HI_{pw} = HI for an exposure pathway (unitless)

HQ_i = HQ for the i^{th} COC (unitless)

The HI_{pw} values are not statistical probabilities of a potential effect. If the HI_{pw} exceeds one, there is a concern for potential noncarcinogenic health effects. In general, the greater the HI

75

above one, the greater the level of concern. However, the level of concern does not increase linearly as the HI approaches or exceeds one.

Noncarcinogenic effects will be presented in the CRA tables similar to those used in the presentation of carcinogenic risk. Each table will show contaminant- and pathway-specific effects with contaminants presented in rows, and pathways presented by columns. HI_{pw}s will be subtotaled across pathways to develop an HI for the exposure scenario (HI_{es}), assuming the same individuals would consistently be exposed to more than one pathway for each contaminant.

HQ_is approaching or exceeding one will be segregated and summed by mode of action or target organ to calculate the total HI by target organ (HI_{to}). A total HI_{to} will also be summed across all pathways and contaminants for a specific receptor scenario. Both of these procedures are approximations of HI_{to}. One significant digit is retained when summarizing the calculated indices.

The CRA will discuss HQs and HIs that exceed one. Factors such as uncertainty inherent in the RfD(s), mode(s) of action, target organ(s), and severity of health effect(s) will be discussed. The pathways and contaminants driving the risk will be noted and discussed. A summary table presenting HI_{es} subtotals for all scenarios will be created for presentation in the CRA risk summary section. This may include placing the results for each scenario in rows, and providing information on HIs, dominant COCs, and dominant pathways in columns.

6.3 Calculating and Characterizing the Dermal Exposure Effects

As discussed in the toxicity assessment (Section 5.0), evaluation and assessment of risks for the dermal route are based on absorbed dose as opposed to the administered dose for other routes (EPA 2001b). The dermally absorbed dose (DAD) must be calculated separately as follows, and the toxicity factors adjusted according to estimated gastrointestinal absorption in critical studies:

$$DAD = \frac{DA_{event}\ x\ EF\ x\ ED\ x\ EV\ x\ SA}{BW\ x\ AT} \qquad \text{(Equation 6-6)}$$

Where:

AT	=	averaging time;
BW	=	body weight;
ED	=	exposure duration
EF	=	exposure frequency;
EV	=	event frequency;
SA	=	surface are; and
DA_{event}	=	C_{soil} x CF x AF x ABS_d

Where:

ABS_d	=	dermal absorption fraction;

76

AF	=	adherence factor of soil to skin;
C_{soil}	=	concentration of COC in soil and
CF	=	conversion factor (10^{-6} kilograms per milligram [kg/mg])

The cancer risk or HI for the pathway is calculated using the following equation:

$$Dermal\ cancer\ risk = DAD \times SF_{abs} \quad \text{(Equation 6-7)}$$

Where:

DAD	=	dermally absorbed dose (mg/kg-day)
SF_{abs}	=	absorbed CSF $(mg/kg\text{-}day)^{-1}$

The noncarcinogenic health hazard is calculated in a similar way:

$$Dermal\ HQ = DAD / RfD_{abs} \quad \text{(Equation 6-8)}$$

Where:

RfD_{abs}	=	absorbed RfD (mg/kg-day)

The carcinogenic risk or HI for the dermal pathway is then presented with the estimates from the other pathways. The estimates for all pathways are subsequently summed, as discussed in Sections 6.1 and 6.2.

6.4 Calculating and Characterizing Radiation Dose

Radiation dose will be calculated using the methodology outlined in the Task 3 Report (EPA et al. 2002). The Residual Radioactivity Computer Code (RESRAD) model (version 6.0) and point-estimate parameter values for exposure variables from the Task 3 Report will be used in dose simulations for the WRW and WRV. The method for calculating radiation dose using the RESRAD program is documented in the Task 3 Report.

Radiation dose will be calculated based on effective dose (hereafter, "dose"), an estimate of damage to the body from ionizing radiation. The dose-based calculations will be performed using the equations and variables in the RESRAD computer model (DOE 2003b). RESRAD calculates radiation dose based on an annual exposure. The amount of exposure is multiplied by a dose conversion factor (DCF) to determine a predicted dose.

6.5 Conducting an Uncertainty Analysis

The uncertainty analysis characterizes the various sources and their contributions to uncertainty in the CRA. These uncertainties are driven by uncertainty in the Site investigation data, likelihood of hypothetical exposure scenarios, transport modes used to estimate concentrations at receptor locations, receptor intake parameters, and toxicity values used to characterize risk. Additionally, uncertainties are introduced in the risk assessment when exposures to several substances across multiple pathways are summed.

77

The concept of uncertainty can be more fully defined by distinguishing between variability and knowledge uncertainty. Variable parameters are those that reflect heterogeneity in a well-characterized population, for which the distributions would not generally be narrowed through further measurement or study. Certain parameters reflect a lack of information about properties that are invariant and whose single, true value could be known exactly by the use of a perfect measuring device. Where appropriate, qualitative uncertainty analysis may distinguish between variability and uncertainty. This type of uncertainty analysis will identify each key source of uncertainty, present an estimate of the relative impact of the uncertainty on the CRA, and include any clarifying remarks.

7.0 ECOLOGICAL RISK ASSESSMENT

Scope: Develop and document the methodology for the ERA portion of the CRA.

This section provides the methodology for the ERA in support of the CRA. The methodology utilizes existing RFETS risk assessment methodologies (DOE 1996b, 1996c) and more recent EPA guidance on performing ERAs at Superfund sites (EPA 1997b, 1999, 2000c, 2001c).

Previous ERA efforts at RFETS include an ERA for the Woman and Walnut Creek watersheds in the BZ. The results of the ERA are presented in the Draft Final Phase I RFI/RI Report Appendix N, Woman Creek Priority Drainage Operable Unit No. 5 (DOE 1995b). Hereafter, this ERA will be referred to as the Draft Watershed ERA. The Draft Watershed ERA has not been approved or formally accepted by the regulatory agencies, and was based on available data collected through 1995. However, available analytical and biological data from the Draft Watershed ERA will be used, if appropriate, to augment the updated and current comprehensive ERA effort.

An ERA has not been performed for areas within the IA. Buildings, parking lots, or other developed areas formerly covered much of the IA and, as a result, the IA did not represent a significant ecological resource. However, all buildings, structures, and parking lots are currently being dismantled and removed. The reasonably anticipated future land use for the IA will be part of a U.S. National Wildlife Refuge, and an ERA is needed to characterize the potential exposure and ecological risk due to residual contamination in soil or other media.

An overview of the ERA portion of the CRA is shown on Figure 7.1. The CRA is intended to document residual ecological risks following the ongoing accelerated actions at the Site. The analysis will include two main phases. Data on ecological contaminants of interest (ECOIs) in abiotic media from the Site will be compared to conservative ESLs that have been developed for abiotic media and a range of representative ecological receptor types (Appendix B). ECOIs are analytes that have been detected in abiotic media. The analysis will be conducted using all Site data from previous investigations and confirmation sampling from accelerated actions or supplemental data collection not related to accelerated actions. The ESL comparisons will be used to identify ecological contaminants of potential concern

78

(ECOPCs) for each receptor of concern (ROC) and EU and to map the locations where the ESLs are exceeded. The terrestrial ecological analysis will be conducted for the same EUs as defined for the HHRA and sitewide for wide ranging receptors. The aquatic ecological analysis will be conducted on a watershed-specific basis using the AEU boundaries shown on Figure 4.1b. Seven AEUs were identified including Rock Creek AEU, McKay Ditch AEU, No Name Gulch AEU, North Walnut Creek AEU, South Walnut Creek AEU, Woman Creek AEU, and Southeast AEU. Ponds and other limited reaches within the boundaries of an AEU may also be assessed.

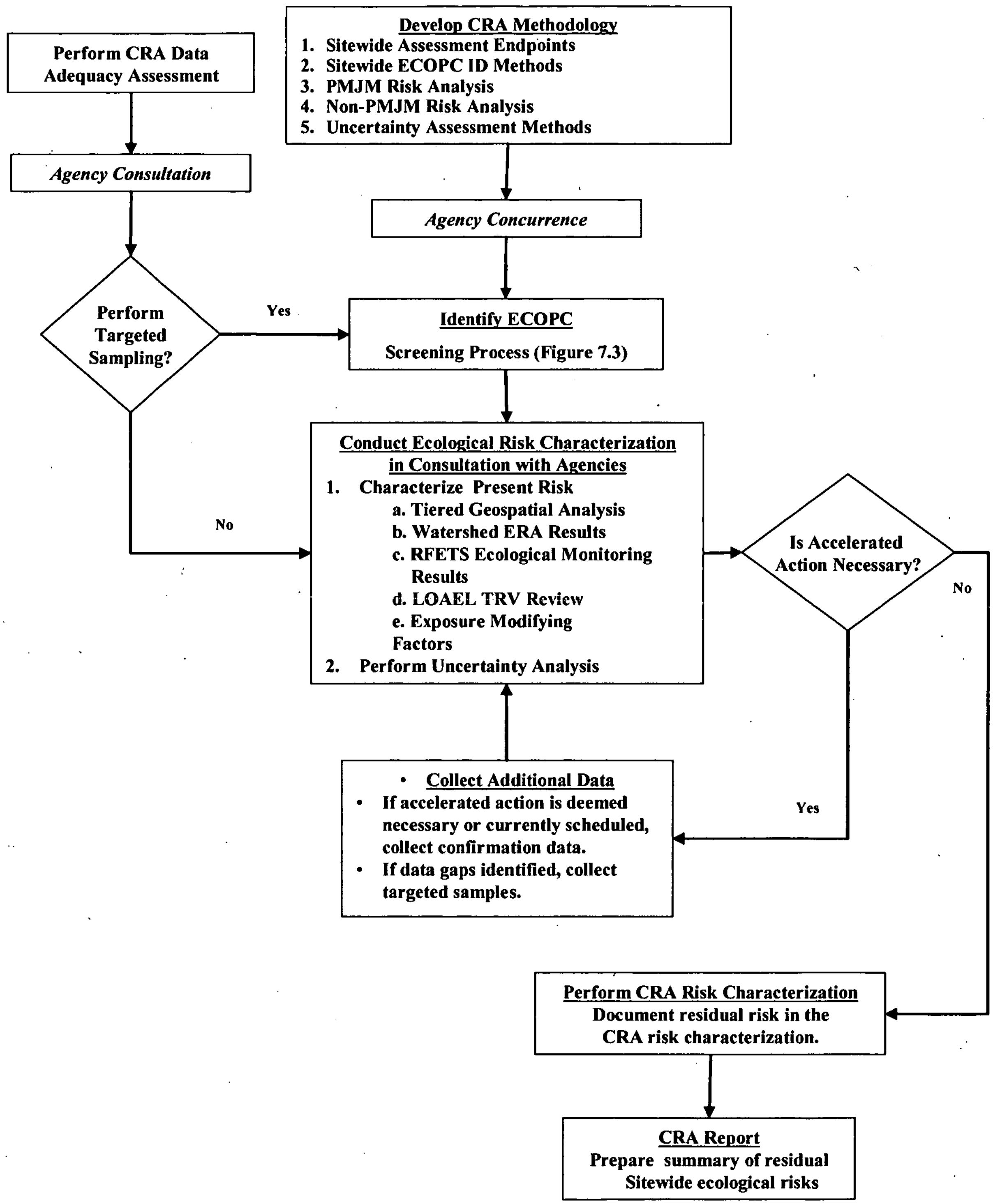
Risk will be characterized for the ECOPCs identified in the comparison of ECOIs to the ESLs. The risk characterization will use additional lines of evidence as outlined on Figure 7.1 and will be completed in consultation with the regulatory agencies. Data gaps will be addressed prior to the CRA in a DAR intended to identify areas where additional data are needed to support the CRA.

ESLs are specific to the feeding guild being evaluated and the level of protectiveness required. For vertebrate ROCs that are not considered to be of special status (rare or threatened), ESLs represent exposures equal to the threshold ESL (tESL) when available. The tESLs are based on the geometric mean between no observed adverse effect levels (NOAELs) and lowest-observed adverse effect levels (LOAELs) from chronic sublethal endpoints. ESLs for the Preble's meadow jumping mouse (PMJM) are more protective because it is a rare species with legal protection over and above the typical receptor. ESLs must be adequately conservative to provide screening-level protection on a subpopulation level. PMJM ESLs are based on NOAELs. ESLs were developed for ECOIs which included the analytes in RFCA Attachment 5, Table 3 (DOE et al. 1996 [as modified]) and other analytes, as necessary.

Data used for the ESL comparison process will be from abiotic media (surface and subsurface soil, surface water, and sediments). For areas that may have undergone accelerated actions, data will be from a combination of confirmation sampling and historical sampling in areas where no removals have occurred. Additional data may also be collected pending the results of the DAR. In addition, the ERA may use the results of Sitewide surface water and groundwater transport modeling efforts to predict exposure of aquatic and terrestrial species at points of potential discharge, such as hillside seeps (terrestrial) and streams (terrestrial and aquatic)

79

Figure 7.1 Sequence of Activities for the ERA



7.1 Use of Draft Watershed Ecological Risk Assessment in the Comprehensive Risk Assessment

> **Purpose:** The results of the previously completed Draft Watershed ERA will be used to support the current assessment of ecological risks from residual contamination at the Site.

Conclusions and data from the Draft Watershed ERA will be important lines of evidence in the risk characterization process. The Draft Watershed ERA represents a comprehensive exposure and risk assessment conducted specifically for the RFI/RI process at RFETS. The results will be used on several levels. For example, risk characterizations may include assumptions about the extent to which ECOPCs are accumulated from abiotic media to biota in the food chain. The literature-based bioaccumulation factors (BAFs) used in developing the ESLs are typically conservative and tend to overestimate the ECOPC concentrations in forage and prey, which, in turn, tend to overestimate risk. BAFs are generally derived from laboratory studies or studies at other sites, and the assumptions used in the ESL calculations may not match the reality at the Site. The Draft Watershed ERA contains data on ECOPC concentrations in biota throughout the active areas of the Site. These data were used in exposure and risk calculations, eliminating the need for the use of BAFs because the actual ECOPC concentrations in tissue were available for the exposure calculations. Therefore, results of the exposure analyses from the Draft Watershed ERA will be thoroughly reviewed for their applicability to the CRA and, where appropriate, biotic data will be used in the CRA exposure analysis portion of the risk characterization to make the analysis more Site-specific than would be possible with only generic BAFs.

Data from the Draft Watershed ERA, RFI/RI reports, and ecological monitoring studies may also be used in the DAR to help determine whether additional data are needed to assess risks in specific areas. This may be especially applicable to PMJM habitats along the creeks where soil and biota data were collected. The results of the Draft Watershed ERA may be used to determine whether additional data are needed to fill spatial data gaps along the drainages. Results of ecological monitoring at the Site may be used to help determine whether there is properly functioning habitat in the EUs.

7.2 Ecological Risk Assessment Background, Site Conceptual Model, and Data Quality Objectives

> **Actions:** Specify information needed on the physical setting; develop an SCM of ecological receptors and exposure pathways to guide the ERA process; specify risk management goals and assessment endpoints; and develop DQOs to guide the ERA process.

81

7.2.1 Environmental Setting

The description of the environmental setting at RFETS will be presented in the RI/FS Report and will include the physical characteristics of the Site, such as topography, geology, and hydrology. The types and extent of plant and animal communities present on Site will be discussed in the ERA.

After accelerated actions, species diversity, abundance, and habitats may change significantly. Therefore, it will be important to the ERA to determine the following:

- Present and future extent of wetlands habitat on Site;
- Sensitive/protected plant species habitat (for example, Ute Ladies'-Tresses) on Site;
- Present and future PMJM habitat locations on Site;
- Other protected or special status species sightings or habitats on Site (for example, bald eagles and peregrine falcons); and
- Vegetation/habitat types to be introduced in the IA.

Much of the needed information is available from ecological characterization and monitoring activities for the Site. Site physical characteristics are well described. Surface water and groundwater flow patterns and future Site configuration have been discussed in various reports that address the Sitewide water balance, actinide migration, and land configuration. Results of these studies will be used in conjunction with data on the nature and extent of contamination, select assessment endpoints, and ECOPC screening methodologies to complete the problem formulation phase of the ERA. Where data from other studies, such as the Draft Watershed ERA, are used to make decisions, the specific data on which a conclusion or result is based will be presented or the location of the original document where the data can be found will be cited.

7.2.2 Site Conceptual Model

Development of the SCM is the first step in the problem formulation, or planning, phase of ERAs (EPA 1997b). The purpose of the SCM is to help identify environmental stressors and the potential pathways by which ecological receptors may be exposed to them. This step allows investigators to identify the potentially complete pathways that will become the focus of the ERA.

An SCM for the Draft Watershed ERA was described in the Sitewide Conceptual Model Technical Memorandum (SCMTM) (DOE 1996c). Specifically, the ERA will provide the following for each exposure unit:

- Description of the environmental setting at RFETS, including the natural physical and biological systems, and a brief description of the primary contaminant source areas or IHSSs;
- Description of the important contaminant fate and transport pathways in abiotic media;
- Description of the important exposure pathways, including primary exposure media, exposure points, receptor guilds, and exposure routes;

82

- Description of receptor guilds and identification of key species in each guild to be used in representative exposure estimates at RFETS;
- Species-specific exposure parameters to be used in estimating exposure to key receptors;
- Measurement endpoints for which data have been collected;
- A summary of existing environmental data, data sources, and ongoing monitoring programs; and
- A description of data gaps associated with determination of the nature and extent of potential contamination.

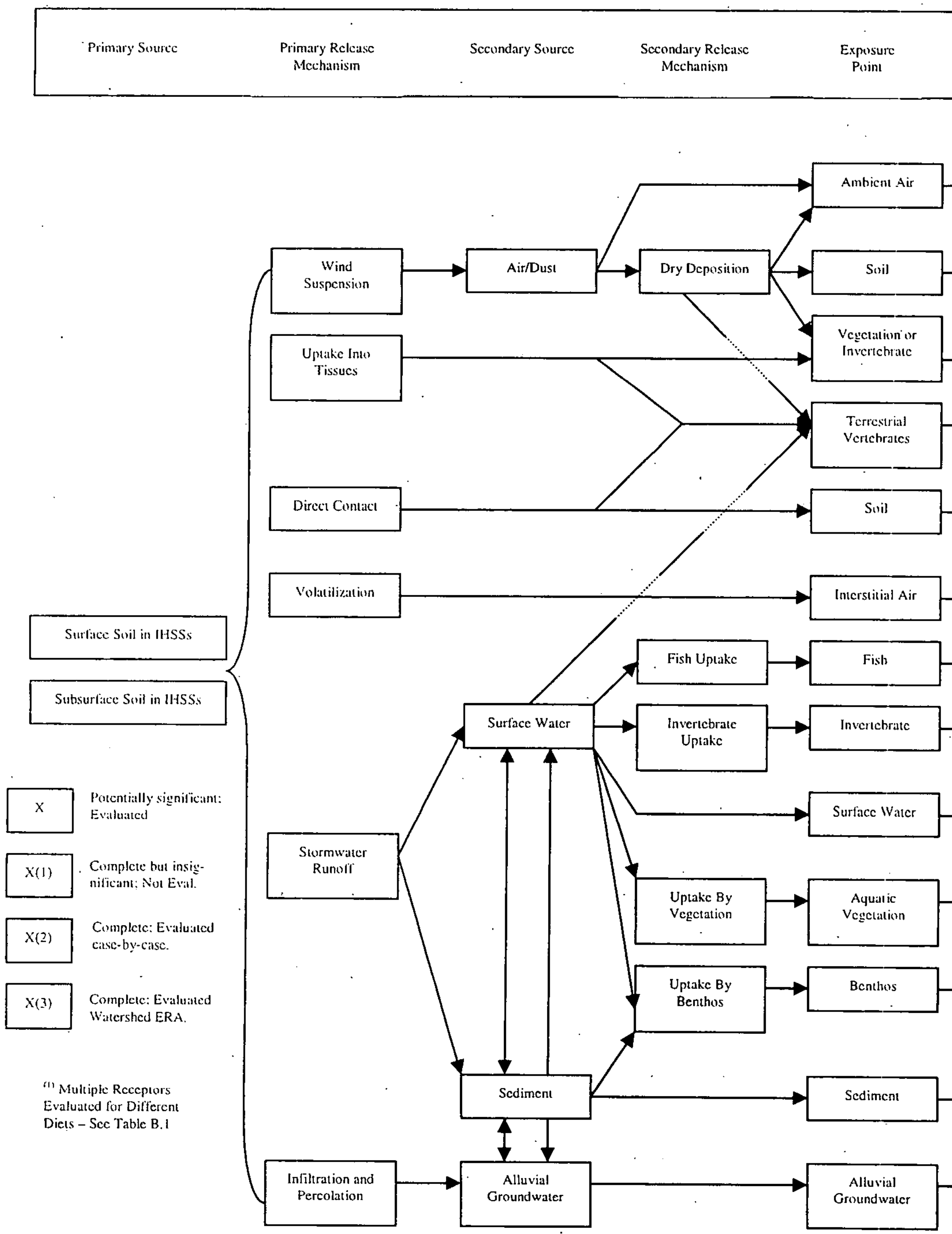
The SCM has been updated to reflect the most appropriate ecological receptors for the Site as a wildlife refuge (Figure 7.2). The purpose of the SCM is to help identify potential pathways by which ecological receptors may be exposed to ECOPCs. The identified pathways become the focus of the ERA. The SCM will also be used to identify measurement endpoints for use in evaluation of assessment endpoints (Suter 1993).

Figure 7.2 identifies several potential pathways that describe how a receptor might contact an ECOPC. The figure identifies pathways that are probably complete, as well as potentially significant pathways for exposure of the receptor groups. Some of the pathways (inhalation and dermal contact with surface water for terrestrial fauna) are designated as potentially complete but insignificant and will not be quantitatively evaluated.

Inhalation of ECOPCs in ambient (surface) air is generally thought to be insignificant compared to ingestion pathways (EPA 2000c) and is generally not evaluated quantitatively in ERAs. In addition, there is little information available to assess the potential toxicity of ECOPC concentrations in air.

Therefore, while the pathway may not be significant, it is identified as a source of uncertainty that may result in an underestimate of exposure. Dermal exposure to surface water is also thought to be a minor pathway for most terrestrial species at RFETS. For metals, polar organic compounds, and radionuclides, skin, fur, and feathers are generally a significant barrier to absorption. Nonpolar organic ECOPCs are more likely to be transferred across external surfaces. However, the low concentrations at which such compounds are found in surface water and the low absorption rates for most terrestrial receptors limit the potential exposures. For terrestrial vertebrates at RFETS, oral ingestion is likely to be more significant and "drive" risk rather than either inhalation or dermal contact. For some scenarios, such as burrowing animals, dermal pathways may be evaluated for organic ECOPCs in soil. However, the oral pathway is expected to be the most important exposure pathway for ECOPCs.

Figure 7.2 Ecological Site Conceptual Model



Exposure Point	Exposure Route	Terrestrial Birds: Passeriforms[1]	Terrestrial Birds: Raptor	Terrestrial Birds: Waterfowl	Terrestrial Mammals: PMJM	Terrestrial Mammals: Burrowing Herbivore	Terrestrial Mammals: Ungulate	Terrestrial Mammals: Small Rodents[1]	Terrestrial Mammals: Carnivore[1]	Community: Plants and Invertebrates	Community: Aquatic Community
Ambient Air	Inhalation	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)		
Soil	Ingestion	X	X		X	X	X	X	X		
	Direct Contact	X(1)	X(1)		X(1)	X(1)	X(1)	X(1)	X(1)	X	
Vegetation or Invertebrate	Ingestion	X	X		X	X	X	X	X		
Terrestrial Vertebrates	Ingestion		X						X		
Soil	Ingestion	X	X		X	X	X	X	X		
	Direct Contact	X(1)	X(1)		X(1)	X(1)	X(1)	X(1)	X(1)	X	
Interstitial Air	Inhalation	X(1)	X(1)	X(1)	X(1)	X(2)	X(1)	X(1)	X(1)		
Fish	Ingestion			X(3)							
Invertebrate	Ingestion			X(3)							
Surface Water	Ingestion	X	X	X(3)	X	X	X	X	X		
	Direct Contact	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)		X
Aquatic Vegetation	Ingestion			X(3)							
Benthos	Ingestion			X(3)							
Sediment	Ingestion			X(3)							
	Direct Contact	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)		X
Alluvial Groundwater	Direct Contact									X(1)	

7.2.3 Ecological Risk Management Goals and Endpoints

In order to focus ERAs, EPA (1997b) recommends identifying overall site management goals, assessment, and measurement endpoints on which the analysis of risk should focus. Assessment endpoints are the explicit description of the ecological values to be protected as a result of management actions at a site. Measurement endpoints are specific data collected to address the assessment endpoints in an attempt to answer the risk questions as they relate to the risk management goals at the site. The overall risk management goal identified for use in developing the ERA for the CRA is:

"Site conditions due to residual contamination should not represent significant risk of adverse ecological effects to receptors from exposure to Site-related residual contamination."

Significant adverse ecological effects imply toxicity that results in reductions in survivorship or reproductive capability that threaten populations or communities at RFETS. For species that are afforded additional regulatory protection due to their rare or threatened status, such as PMJM, significant adverse effects can occur even if individuals are affected. Therefore, the assessment for PMJM will address the potential for individual mice to be adversely affected by contact with ECOPCs. For other species with stable or healthy populations, the assessment will focus on population-level effects where some individuals may suffer adverse effects, but the effects are not ecologically meaningful because the overall Site population is not significantly affected.

For PMJM, the overall risk management goal and endpoints are:

- **Goal**: Prevent adverse effects on individual PMJM due to lethal, mutagenic, reproductive, systemic, or general toxic effects of contact with ECOPCs from the Site.
- **Assessment Endpoints**: Survival, growth, and reproduction of individual PMJM at the Site.
- **Measurement Endpoints**: Hazard quotients (HQs) derived based on comparison of total intake measures, calculated from PMJM-specific ingestion models, of ECOPCs from abiotic data (soil, sediments, and surface water) and food items to toxicity reference values (TRVs).

For non-PMJM receptors, the risk management goal and endpoints are:

- **Goal**: Prevent adverse effects on populations due to lethal, mutagenic, reproductive, systemic, or general toxic effects of contact with ECOPCs from the Site.
- **Assessment Endpoints**: Survival, growth, and reproduction adequate to sustain populations at the Site.
- **Measurement Endpoints**: HQs derived based on comparison of total intake measures, calculated from receptor-specific ingestion models, of ECOPCs from abiotic data (soil, sediments, and surface water) and food items to TRVs.

85

The receptors to be included as assessment endpoints for the Site are shown in Table 7.1. These receptors were identified based on ecological functional groups, then representative species were identified to focus the analysis.

Table 7.1 Representative Species for the ERA

Functional Group	Representative Species
Burrowing Small Mammal	Black-tailed Prairie Dog
Herbivorous or Omnivorous Small Mammal	Deer Mouse
Insectivorous Small Mammal	Deer Mouse
Herbivorous or Omnivorous Bird	Mourning Dove
Insectivorous Bird	Mourning Dove
Ruminant Wildlife	Mule Deer
Mammalian Predator	Coyote
Avian Predator	American Kestrel
Plant	General
Terrestrial Invertebrate	General
Aquatic Life	General aquatic life, including amphibians and benthic macroinvertebrates (sediment exposure)

Note: Data and results used in the Watershed ERA and previous assessments for waterfowl and shorebirds will be presented and compared to evaluate whether the assumptions and data used are representative of current conditions at the site.

7.2.4 Ecological Risk Assessment Data Quality Objectives

As with the HHRA process, the approach to the ERA is presented in the format of DQOs (EPA 1997b).

Step 1: State the Problem

Potentially toxic substances have been released at the Site. Ecological receptors could be exposed to the substances. To date, ecotoxicological risks have been characterized only for portions of the BZ in the Woman Creek and Walnut Creek watersheds (DOE 1995b).

The problem to be addressed by the ERA is:

> *"The risks to all reasonably expected ecological exposures to residual contaminants present in the environmental media following accelerated actions must be quantified in a technically sound and defensible manner."*

Step 2: Identify the Decision

The ERA will characterize what is known about the exposures, and whether they have resulted, or could result, in significant adverse effects to ecological receptors. The overall Site management question to be addressed by the ERA is:

> *"Are residual long-term ecological risks from Site-specific contaminants acceptable for the long-term Site use and management goals?"*

In order to address this general decision, additional decisions to be addressed include:

86

- Has a methodology been developed to adequately assess ecological risks?
- Has a methodology been developed to adequately identify ECOPCs?
- Is the CRA SCM adequate to define all viable exposure scenarios, exposure pathways, and receptors based on the reasonably anticipated future land use?
- Have all EUs and watersheds been adequately defined and established?
- Have the nature and extent of inorganic, organic, and radionuclide analytes within EUs and watersheds been identified with adequate confidence, based on evaluation of Site process knowledge and analytical data?
- Have samples of adequate number and quality been collected within EUs and watersheds to perform the risk assessment?

Step 3: Identify the Inputs to the Decision

Information needed to resolve the ERA decision statements is as follows:

- Existing data for areas under consideration;
- Results from a DQA screen (Section 3.1.5) applied for each type of environmental medium as prescribed in this Methodology;
- Results from the ECOPC screen compared to ecotoxicologically-based screening-level values;
- Maps for ECOPCs depicting the distribution of sampling locations with concentrations compared to ESLs;
- Ecological data that have become available since the completion of the previous ERAs (for example, the Integrated Ecological Monitoring program); and
- Data and results from the previous ERAs conducted at RFETS.

Step 4: Define the Study Boundaries

Study boundaries are used to determine the areas from where data will be used, and identify where future sampling will occur. These study boundaries are as follows:

- Only post-1991 (i.e., collected on or after June 28, 1991) data meeting CRA data use guidelines (e.g., exclude data that are no longer relevant due to accelerated action removals, exclude data from field screening methods) will be used in the ecological risk assessment. The assessment will be confined to the area within the current RFETS boundary unless the on-site assessment indicates circumstances that could alter the conclusions of the off-site assessment performed earlier for OU 3 (DOE 1996a).
- Soil will be assessed generally from the land surface to a depth below ground surface that is consistent with both potential contamination and the depth to which mammals may burrow in the RFETS environment (8 feet).
- The ERA portion of the CRA will consider ECOPCs in surface water, sediment, and soil. The results of modeling the transport of groundwater to surface water will be

compared to ESLs for aquatic life. Further assessment will be performed for ECOPCs failing the screening-level assessment.

Step 5: Develop a Decision Rule

In addition to the decision rules cited for data adequacy in Section 3.0, decision rules that describe how the data will be evaluated for the ERA are listed below.

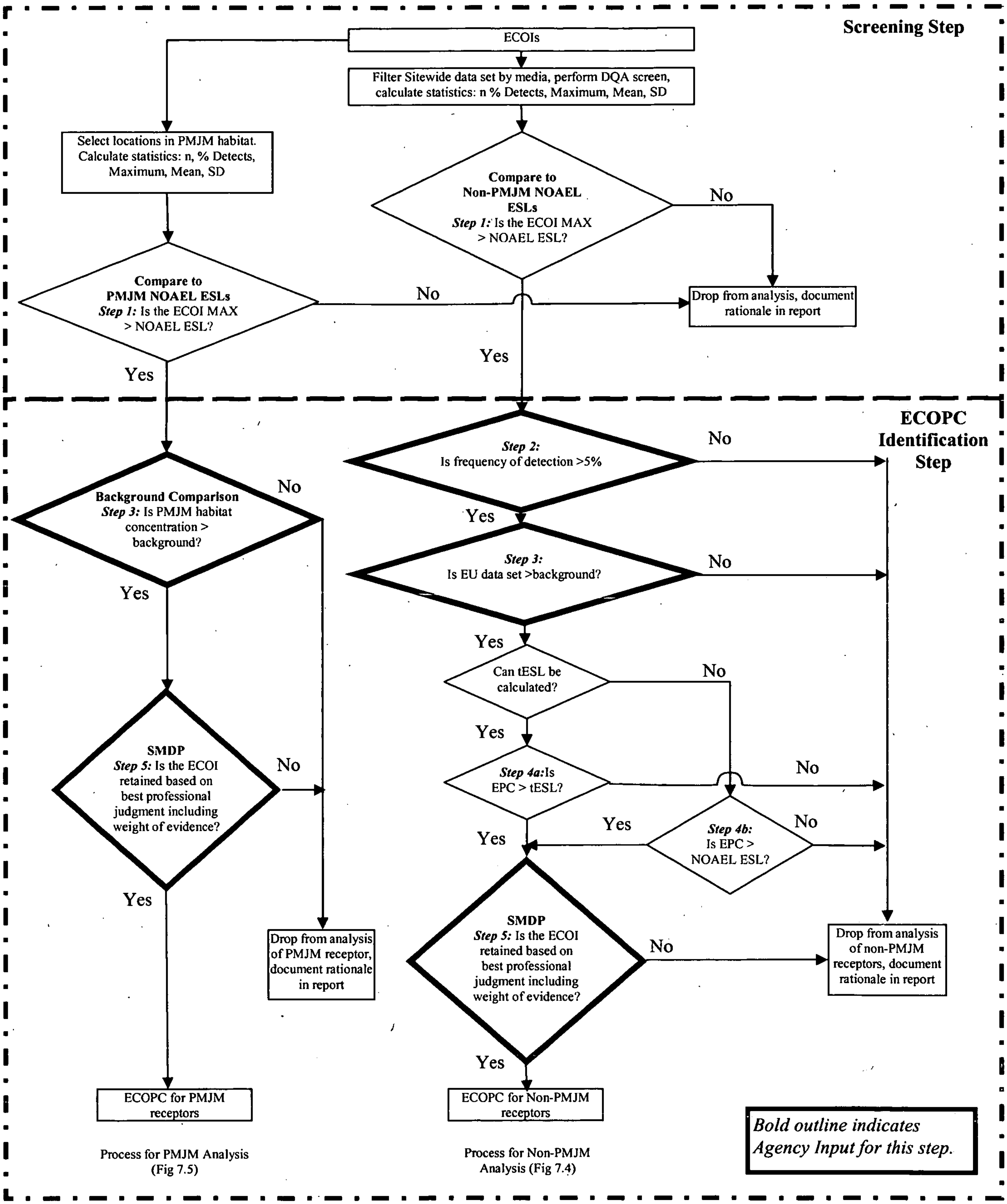
- The ECOPCs that pass through the screening process shown graphically on Figure 7.3 will be evaluated in the risk characterization phase of the CRA.

<u>Non-PMJM Receptors</u>

- For large-home range receptors (mule deer and coyote), if the Sitewide and EU-specific 95UCL (Section 7.4.1) of the mean does not exceed the NOAEL ESL or tESL and Professional Judgment indicates the ECOI should not be retained as an ECOPC, no further risk assessment is necessary for that exposure scenario and the results will be documented in the CRA Report. The decisions to eliminate ECOIs based on Professional Judgment will be made with Regulatory Agency input.
- For small-home range receptors (deer mouse, prairie dogs, kestrel, and mourning doves), if the EU-specific 95UCL of the 90th percentile of the distribution of data (Section 7.4.1) does not exceed the NOAEL ESL or tESL and Professional Judgment indicates the ECOI should not be retained as an ECOPC, no further risk assessment is necessary and the results will be documented in the CRA Report. The decisions to eliminate ECOIs based on Professional Judgment will be made with Regulatory Agency input.

98

Figure 7.3 Sitewide ECOPC Identification Process



- For terrestrial invertebrate receptors and plants, if soil ECOIs with EU-specific 95UCL of the 90th percentile concentrations (Section 7.4.1) do not exceed the appropriate chronic ESL and Professional Judgment indicates the ECOI should not be retained as an ECOPC, no further risk assessment is necessary and the results will be documented in the CRA Report.
- For aquatic receptors, if sediment and/or surface water ECOIs with AEU-specific 95 UCL of the 90th percentile concentrations (Section 7.4.1) do not exceed the appropriate ESL and Professional Judgment indicates the ECOI should not be retained as an ECOPC, no further risk assessment is necessary and the results will be documented in the CRA Report. In addition, assessments will be performed to evaluate data from areas within the AEU that may be of concern because of the distribution of ECOI sampling and concentrations. Two sets of maps will be produced to be included in the assessment. ECOIs will be mapped when:

    1. The ECOI maximum concentration is greater than the ESL, but the 95 percent upper confidence limit on the mean (UCL) or 95 percent upper tolerance limit (UTL) is less than the ESL.
    2. The ECOI is detected at a frequency of less than 5 percent.

  The assessment will ensure that ECOIs that may be of concern in ponds and other limited reaches of the watershed are properly evaluated.
- All receptor/ECOPC pairs that do not meet the decision rules discussed above will be carried into a risk characterization in consultation with the regulatory agencies. The risk characterization process will be documented in the CRA and may include:
    - Tiered geospatial analysis;
    - Discussion of alternative TRVs;
    - Review of ECOPC bioavailability;
    - Evaluation of Site-specific tissue data;
    - Review of previous risk assessment data;
    - Evaluation of potential Type II errors;
    - Spatial variability of ECOPC concentrations; and
    - Other pertinent techniques to further characterize risk.

<u>PMJM Receptors</u>

- Risks from ECOPCs to the PMJM receptor, within the designated PMJM habitat, will be evaluated on a habitat patch basis. Sampling locations where the PMJM NOAEL ESL is exceeded will be mapped.
- Those ECOPCs that do not meet the decision rules discussed above will be carried into a risk characterization process in consultation with the regulatory agencies to further characterize potential risk to the PMJM receptor. This process will be documented in the CRA and may include:
    - Geospatial analysis of data;
    - Review of toxicity, bioavailability, and other potential exposure-modifying

90

factors;
- Review of previous risk assessment data;
- Evaluation of potential Type II errors; and
- Other pertinent techniques to further characterize risk.

Step 6: Specify Tolerable Limits on Decision Errors

Several sources potentially contribute uncertainty to the CRA. Best professional judgment and input from the consultative process will be used for decisions regarding data gaps and risk management actions. The rationale and justification will be included in the CRA Report.

For exposure areas that are evaluated based on the 95UCL of the mean, the Type I error rate is fixed at 5 percent regardless of data quality. For this evaluation, the probability of a Type II decision error, which depends strongly on data quality, will remain undefined unless it is deemed necessary to define it in order to adequately characterize risk in the CRA.

For exposure areas that are evaluated based on the 95UCL of the 90th percentile of the distribution of soil concentration values, the Type I error rate should not be more than 5 percent when the true 90th percentile is larger than the ESL. The Type II error rate will remain undefined unless it is deemed necessary to define it in order to provide adequate data to characterize risk in the CRA.

Step 7: Optimize the Design

Based on the iterative nature of the DQO process, any decision that is not consistent with project goals will result in a reinitiation of the DQO process. If determination of the nature and extent of analytes is found to be inadequate, further sampling will be initiated. If sampling power is determined to be inadequate for any given scenario and set of analyte data, more samples may be collected and the sampling power can be recalculated.

7.2.5 Data Types and Adequacy

The SCM suggests that ecological receptors may be exposed to ECOPCs in abiotic and biological media. Site data on ECOPC concentrations in soil, surface water, and sediments will be evaluated to support the CRA. Biological tissue analysis results will not be used in the initial phase of the CRA assessments. However, biological tissue analysis to describe potential uptake of ECOPCs into prey and forage species will be considered in the risk characterization phase.

In addition to the data adequacy decision rules provided in Section 3.1.5, the following guidelines will be used to evaluate adequacy of data for the CRA:

- *Spatial Representativness*: For an EU, a data set that consists of samples evenly distributed throughout the EU is considered spatially representative of the entire exposure area. For an AEU drainage, a data set that consists of samples that are located upstream, midstream, and downstream, and after confluences with other drainages is considered spatially representative.
- *Temporal Representativness*: A data set that is composed of measurements made in the current time frame (e.g., 2001 or later) is considered temporally representative;

91

however, if there are no trends in concentrations over time, then data across all time periods is considered temporally representative. This guideline is only applicable to sediment and surface water because environmental forces are not expected to appreciably alter analyte concentrations in surface soil over the course of 10-15 years.

The IABZSAP (DOE 2004a) identifies laboratory analytical methods to provide data with adequately low method detection limits (MDLs) and practical quantitation limits (PQLs) to allow meaningful comparison to ESLs in abiotic media. A table presenting these values will be provided in the CRA to indicate where detection limits are adequate for use.

ECOPC concentrations in soil and sediment will be expressed as "total recoverable." Risks to aquatic organisms are most strongly related to dissolved concentrations, but in order to provide a thorough assessment, risks will be evaluated both for dissolved and total recoverable concentrations where appropriate. ECOPC concentrations in surface water will be appropriately compared to water quality standards for protection of aquatic life. Surface water data used to assess risks to wildlife drinking the surface water will be based on total recoverable (that is, unfiltered) analyses. Data on ECOPC concentrations in biological tissue were collected for the Draft Watershed ERA and associated studies. These data may also be used in a line-of-evidence approach to risk characterization after the ECOPC identification steps have been completed. Data adequacy will be evaluated as described in Section 3.1.5.

In addition to the comparison of ESLs directly to analytical data in the ECOPC identification step, models may be used to estimate ECOPC concentrations in stormwater runoff from potentially contaminated soil and groundwater that may surface at seeps or in streams. Both sources of water could contact aquatic biota or wildlife.

Adhering to the specifications of the DQOs as outlined above will ensure the adequacy of data for use in the ERA. In addition, the DQA will help ensure that the quality of data is consistent with RFETS standards.

7.2.6 Ecological Screening Levels

As noted previously, identification of ECOPCs to be evaluated in detail in the risk characterization portion of the CRA will be based on a comparison of Site abiotic media concentrations to ESLs. ESLs for wildlife were developed based primarily on potential ingestion of ECOIs in abiotic media, forage, and prey, and the transfer of ECOIs among these media. The specific methodology for developing ESLs is presented in Appendix B. The following is an overview of the ESL calculation process for each of the environmental media.

Soil

EPA's ecological soil screening levels (Eco-SSLs) (EPA 2003c) process was used as general guidance for developing soil ESLs or soil screening levels (SSLs). The Eco-SSL process outlines the acquisition of primary literature sources, followed by extensive review and scoring of documents.

As an alternative to this lengthy and time-consuming process, available compilations of TRVs from several sources were used extensively to obtain reliable and defensible values. In order of preference, these sources include:

- Ecological Soil Screening Level Guidance (EPA 2003c);
- U.S. Navy Soil Screening Levels (PRC 1998); and
- Oak Ridge National Laboratory (ORNL) (Sample et al. 1996).

For a subset of ECOIs and for those ECOIs without previously published TRVs, a literature review was conducted to obtain relevant toxicity information. Only studies using chronic (or subchronic) exposure periods and measuring growth, development, reproductive, and mortality endpoints were selected for use in the calculation of ESLs. The data scoring and weighting system described in the Eco-SSL guidance (EPA 2003c) was used to score the data and calculate the necessary TRVs for those ECOIs that underwent a literature review resulting in more than one applicable TRV.

ECOIs with no or inadequate toxicity data available were identified and handled on a case-by-case basis with input from the regulatory agencies.

No interclass extrapolations were used to extrapolate avian TRVs from mammalian endpoints. In addition, for those ECOIs that have only a LOAEL TRV available, the NOAEL TRVs were estimated by dividing by 10. No estimates of LOAEL TRVs were made.

For those ECOIs that have adequate TRV data available (that is, NOAEL and LOAEL values are available from toxicity studies), and meet the criteria specified in Appendix B, a tESL was also calculated by estimating the geometric mean between the NOAEL and LOAEL TRVs.

For small receptors with small- to moderate-sized home ranges, average intake parameters, such as the ingestion rate of food, were used in the ESL calculation process. For larger, more wide-ranging receptors (that is, coyote and mule deer), high-end intake exposure parameters were used to provide a conservative estimate of food intake over the entire Site. ESLs for receptors that burrow (for example, prairie dogs) were applied to both surface and subsurface soil. A detailed discussion of the ESL calculation process is presented in Appendix B.

For terrestrial plants and terrestrial invertebrates, benchmark ESLs were derived from several sources (Appendix B). These benchmark values are meant to be compared directly to soil concentrations to provide a general estimate of the potential for risk to the plant and invertebrate receptors.

Sediments

For sediments, ESLs were developed for many chemicals and are available from several sources. Sediment ESLs are generally expressed as concentration terms and, therefore, require no calculations or assumptions. However, the assumptions underlying the development of sediment ESLs were evaluated to determine consistency with uses at RFETS. A more detailed discussion of the sources used to identify sediment ESLs is provided in Appendix B.

93

Surface Water

For surface water, ecotoxicologically based water quality criteria (WQC) are available from several sources. As a screening step, WQC were retrieved from State of Colorado water quality standards, federal Ambient Water Quality Criteria, and other databases such as that from ORNL (1994) and the Michigan Department of Environmental Quality (Rule 57), (MIDEQ 2003). A more detailed discussion of the sources of WQC is presented in Appendix B.

No surface water ESLs were calculated for the ingestion of surface water by terrestrial vertebrates. It is recognized in Figure 7.2 that surface water ingestion by vertebrate species is a complete and potentially significant pathway for exposure to ECOPCs, and the ingestion of surface water pathway will be included in the risk characterization for those ECOPCs identified in the soil screening. However, following the example of the Eco-SSL guidance (EPA 2003c), the soil and prey tissue ingestion pathways were emphasized in the ECOPC identification process for terrestrial wildlife receptors. It is also assumed that the surface water ESLs that focus on aquatic organisms are more sensitive values for use in identifying ECOPCs than vertebrate surface water ingestion ESLs.

Given the conservative nature of the ECOPC screening for soil and food ingestion pathways, it is unlikely that an ECOI that was not identified as an ECOPC for terrestrial vertebrates in soil would have a potential for risk from the ingestion of surface water due to the small proportion of water intake when compared to other potential exposure routes. The Draft Watershed ERA (DOE 1995b) included the surface water ingestion pathway in the screening step for the mule deer and coyote receptors. That document concluded that no risk was present for those receptors inhabiting the Woman Creek and Walnut Creek drainages. In general, the intake of ECOIs is less compared with the food web uptake of bioaccumulative compounds. Several bioaccumulative ECOPCs were evaluated in the Draft Watershed ERA.

Risk estimations that included the ingestion of surface water showed that no risk was estimated for the large receptors at the Site. These data and results will be discussed and summarized in the CRA. Given that previous investigations have not predicted risk to even bioaccumulative compounds through the ingestion of food items, soil, and surface water, it is unlikely that the inclusion of the water ingestion pathway would alter the outcome of the ECOPC identification process.

Radionuclides

Soil benchmarks for radionuclides were developed for RFETS during the Draft Watershed ERA (Higley and Kuperman 1995). Since then, DOE's Biological Dose Assessment Committee (BDAC) has developed additional procedures for assessing exposure and risk to terrestrial and aquatic biota using the RESRAD-BIOTA (DOE 2003b) computer code for calculating protectiveness.

For some radionuclides, Higley and Kuperman values are higher (less conservative) than those calculated with the RESRAD-BIOTA procedures. However, for terrestrial animals the radiation exposure limit cited in RESRAD-BIOTA as protective of ecological receptors (1 rad/day) is 10-fold that assumed in Higley and Kuperman (0.1 rad/day). Values developed for ecological receptors using either approach were considerably higher than values adopted for managing radionuclide risks to human receptors at the Site. In most cases, soil criteria were two to three orders of magnitude larger. Therefore, if the Site is managed to protect human health and EPCs are calculated using similar methods, then ecological receptors will be protected. This applies to special status species (for example, threatened or endangered) and nonthreatened or endangered receptor groups.

An exception to the above is exposure to subsurface soil and surface water. For the human health assessment, the pathway to subsurface soil will not be evaluated in the IA because institutional controls prevent disturbance of soil; therefore, ESLs will be needed. For surface water, ecological benchmarks are lower than human health values for some radionuclides, primarily due to the higher use rate assumed in the calculations. RESRAD-BIOTA was used to calculate all of the radionuclide ESLs that will be used in the CRA. The ESLs are presented in Appendix B.

7.3 Sitewide Ecological Contaminant of Potential Concern Identification

Action: Identify ECOPCs for the CRA.

A comprehensive list of Sitewide ECOPCs will be developed for the CRA based on data representing conditions after accelerated actions. ECOIs identified in Appendix B will form the starting point for the ECOPC identification process shown on Figure 7.3. The ECOPC screen will use maximum concentrations for potentially toxic analytes (that is, analytes that are not nutrients, such as calcium, potassium, and sodium).

The entire Sitewide database will be queried, filtered by media, and subjected to a DQA screen (Section 3.1.5) to identify which data meet the needs of the DQOs discussed in the previous section. Following the DQA screen, two data sets will be created for each EU for soil. One will include all EU data; the other will include only sampling locations in PMJM habitat within the EU. For the AEUs, AEU-specific databases will be created for surface water and sediment. For each data set, "U-" qualified nondetects will have one-half the reported result concentration substituted. Basic descriptive statistics will then be calculated, such as number of samples, percent detections, maximum detections, mean detection, and standard deviation.

Soil data in each data set will be compared to NOAEL-based ESLs. If the maximum detected concentration of the ECOI does not exceed the NOAEL-based ESL, risks will be considered negligible, the ECOI will be dropped from further analysis in the CRA and the rationale for removing it from further analysis will be recorded and presented in the CRA Report. If the maximum detected ECOI concentration in the PMJM habitat data set exceeds the NOAEL-based ESL, it will be retained as an ECOPC for the PMJM.

ECOIs that have detected concentrations greater than the NOAEL-based ESL in the EU or AEU data set will undergo further analyses on an EU-specific or AEU-specific basis to determine their status as ECOPCs.

7.3.1 Non-Preble's Meadow Jumping Mouse Receptors

The radionuclide and metal ECOIs for non PMJM receptors passing the 5 percent screen will then be statistically compared to background concentrations, as appropriate, using the methods discussed in Section 4.4.8. A determination of whether the tESL can be reliably calculated was conducted (Appendix B). For those ECOIs that have adequate TRV data available, the tESL was calculated using the geometric mean between the NOAEL and the LOAEL ESLs. The tESL will then be used in the ECOPC screening process. For those ECOIs for which no tESL can be calculated, the NOAEL ESL will be used in the EPC step of the ECOPC screening process.

For the small-home range receptors, the 95UCL of the 90th percentile for each EU will be used as the EPC in the screening process. For the receptors with large home ranges, the 95UCL of the mean for each EU and also the Site as a whole will be used as the EPCin the screening process.

Any ECOI that fails the EPC comparison shown on Figure 7.3 will be evaluated using best professional judgment as to its potential to cause risk to wildlife receptors at the Site. This decision, or scientific management decision point (SMDP), will be made in cooperation with regulatory agency personnel. The determination will consider process knowledge and spatial and temporal factors, as well as the physical and chemical properties of the ECOI as they pertain to the potential for risk to the wildlife receptors at the Site (EPA 1997b). The Professional Judgment process is described in Section 4.4.9. Those ECOIs that pass the EPC comparison step shown on Figure 7.3 and Professional Judgment indicates the ECOIs should not be retained as ECOPCs, will be dropped from further analysis and documented in the CRA Report.

7.3.2 Preble's Meadow Jumping Mouse Receptors

All ECOIs that exceed the NOAEL SSL for the PMJM within PMJM habitat (that is, 150-foot USFWS buffer [Figure 7.6]) will be compared to background concentrations using the methods discussed in Section 4.4.8. If it is determined that concentrations of the ECOI in PMJM habitat in an EU do not statistically exceed background concentrations of the ECOI, the ECOI will be reviewed in consultation with the regulatory agencies for removal from the ECOI list. The ECOIs eliminated from further consideration in this step will be documented and discussed in the uncertainty section of the CRA Report. The ECOIs that remain will be carried forward and evaluated using Professional Judgment as described for non-PMJM receptors in Section 7.3.1. The Professional Judgment process is described in Section 4.4.9 The ECOPCs will be discussed in detail in the risk characterization section of the CRA Report.

The output from the EU or AEU ECOPC screen will be a list of ECOPCs in PMJM habitat and a list of ECOPCs for representative ecological receptors at the Site. The ECOPCs identified in these lists will be carried forward through the risk characterization process described in the following section. All steps in the process will be documented in the CRA Report.

96

7.4 Risk Characterization Process

Action: Assess risks for the PMJM in its habitat areas and other receptors in appropriate areas Sitewide.

The screening-level assessment described earlier defines the process for making preliminary decisions about potential risk, such as the identification of ECOPCs. The risk characterization process will define a range of potential risks to on-site receptors from the ECOPCs.

Characterization of risk will focus on the overall results for each assessment endpoint. The overall risk will be summarized for each receptor group and level of biological organization (that is, individual or population level of protection), as appropriate for the assessment endpoints. As noted by EPA (1997b), a well-balanced risk characterization should "...present risk conclusions and information regarding the strengths and limitations of the assessment for other risk assessors, EPA decision-makers, and the public."

Risk characterization has two main components: the risk estimation and the risk description. The risk estimation will summarize results of the analysis, identifying the receptors and ECOPCs and a range of potential risks and the locations/EUs where risk may be present. The risk description will then provide context for the analysis, including the proportions of Sitewide habitats that are affected, and interpretation of overall results including data from the Draft Watershed ERA.

Potential risks to terrestrial plants, invertebrates, birds, and mammals will be evaluated using a hazard quotient (HQ) approach. An HQ is the ratio of the estimated exposure of a receptor to a TRV that is associated with a known level of toxicity, either a no effect level (NOAEL or NOEC) or an effect level (LOAEL or LOEC):

$$HQ = Exposure / TRV$$

The units used for exposure and TRV depend upon the type of receptor evaluated. For plants and invertebrates, exposures and TRVs are expressed as concentrations (mg/kg soil). For birds and mammals, exposures and TRVs are expressed as ingested doses (mg/kg/BW/day). The Methodology and input parameters that will be used to calculate ingested doses are provided in Appendix B.

In general, if the NOAEL-based HQ is less than 1, then no adverse effects are predicted. If the LOAEL-based HQ is less than 1 but the NOAEL-based HQ is above 1, then some adverse effects are possible but it is expected that the magnitude and frequency of the effects will usually be low (assuming the magnitude and severity of the response at the LOAEL are not large and the endpoint of the LOAEL accurately reflects the assessment endpoints for that receptor). If the LOAEL-based HQ is greater than or equal to 1, then the risk of an

97

adverse effect is of potential concern, with the probability and/or severity of effect tending to increase as the value of the HQ increases.

When interpreting HQ results for non-PMJM ecological receptors, it is important to remember that the assessment endpoint to non-PMJM receptors is based on the sustainability of exposed populations, and risks to some individuals in a population may be acceptable if the population is expected to remain healthy and stable. For threatened and endangered species, such as the PMJM, the interpretation of HQ results is based on potential risks to individuals rather than to populations.

The risk description will incorporate results of the risk estimates along with the uncertainties associated with the risk estimations and other lines of evidence to evaluate potential chemical effects on ecological receptors. Information considered in the risk description includes receptor groups potentially affected; type of TRV exceeded (e.g., NOAEL versus LOAEL); relation of EU concentrations to other criteria such as EPA EcoSSLs; and risk above background conditions. In addition, other site-specific and regional factors are considered such as the use of a given ECOPC within the EU or AEU related to historical RFETS activities; comparison of ECOPC concentrations within the EU or AEU to the rest of the RFETS site as it relates to background; and/or comparison to regional background concentrations.

The following sections describe the process for conducting the ecological risk characterization in the CRA for the Site. Two separate approaches will be used in the CRA depending on the status of the habitat designation. The risk characterization process for those areas defined as non-PMJM habitat is presented in Section 7.4.2, while the risk analysis process for the PMJM habitat area is presented in Section 7.4.3.

7.4.1 Definition of Exposure Units and Calculation of Exposure Point Concentrations

Exposures to terrestrial ecological receptors will be calculated based on the EUs described for human health (Figure 4.1). Wide-ranging species that generally utilize areas larger than the EUs (that is, coyote and mule deer) will also be addressed using Sitewide data. The EUs are reasonable aggregations of common source areas, hydrological systems, and habitat for assessing ecological risk. Exposure to aquatic receptors will be calculated on an AEU-specific basis and may be evaluated for ponds or other limited reaches within the AEU.

For wide-ranging receptors, some high-end intake exposure parameters will be used to estimate exposure to the highly exposed individual rather than the average individual. These parameters are discussed in detail in Appendix B. Risks to these high-end receptors will be evaluated using upper-bound EPCs. EPCs will be estimated using the tiered geospatial approach described in Section 4.6.

The initial analysis of risks to ecological receptors will use the Tier 1 method of the geospatial approach. Data are treated as if they are randomly located and each sample is weighted equally. The risk calculations based on Tier 1 will tend to be conservative (that is, will tend to overestimate risks) when the data set is biased toward areas with elevated contamination (common at RFETS). If an area is identified as being of potential concern using the Tier 1 approach, then Tier 2, area averaging, will be applied to derive a more

98

realistic estimate of risk. The Tier 3 kriging approach will only be implemented as needed after an initial analysis using Tiers 1 and 2.

The Tier 2 approach will be applied as described in Section 4.6. However, the grid means will be used to calculate a 95UCL or estimate the 90th percentile of the distribution of grid means depending on the receptor. The 95UCL of the 90th percentile will also be estimated. Statistical methods described in Section 4.0 will also be applied for the calculation of the ecological EPCs.

Data distribution testing will be performed for all ECOPCs retained following the ESL screen to aid in deciding the statistical test to use for comparisons to background and calculation of the EPCs. Testing will be conducted using the methods specified in Section 4.4.7, using the ProUCL (Version 3.0) computer program (Singh et al. 2004). The ProUCL recommendations will be used in all cases. Program printouts of results will be presented in the CRA Report. The assigned distribution will then be used to determine the appropriate test for background comparisons, estimate a 95UCL concentration, and calculate the 95UCL of the 90th percentile.

The one-sided 95UCL for use as an EPC for large-home range receptors will also be calculated using the ProUCL software, as detailed in Section 4.6.1. The 95UCL of the 90th percentile of the appropriate distribution (normal, lognormal, gamma, or nonparametric) for use as an EPC for small-home range receptors will be calculated using S-Plus (Version 6.1) (Insightful Corporation 2002) statistical software. The tiered approach specified in Section 4.6 will be used.

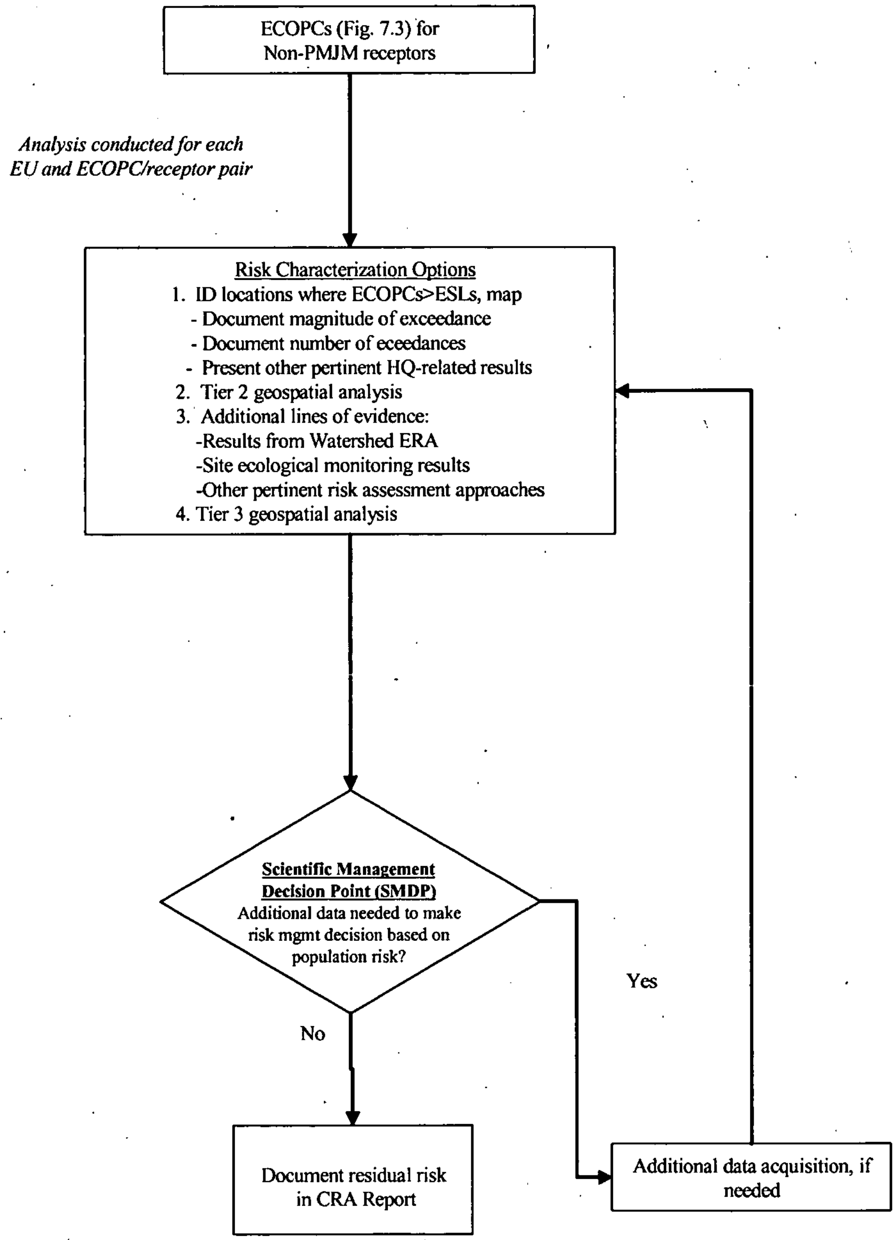
For PMJM, sampling locations within PMJM habitat in each EU will be evaluated separately (Section 7.4.3). For the PMJM default exposure scenario, and any alternate scenarios evaluated in the Uncertainty Analysis, the 95UCL of the mean for each habitat patch will be used as the EPC. In cases where samples/data from within a specific PMJM habitat patch are not available, adjacent sample locations may be assumed to be within the habitat patch. Or, if it can be determined that PMJM habitat patches from within the same EU (i.e., contiguous with habitat patches without data) are expected to represent similar chemical characteristics, then habitat patches from within the EU may be combined for the assessment. Assumptions for data aggregation will be determined with Regulatory Agency input. Data assumptions and uncertainties will be discussed in the uncertainties section of the CRA.

7.4.2 Risk Characterization Process for Nonthreatened or Endangered Species Receptors

Risk characterization for non-PMJM receptors will be conducted in the CRA, following the procedures shown on Figure 7.4, for those ECOPCs identified in the screening process described in Section 7.3.

The analyses described in this section apply to all nonthreatened or endangered species. The analysis will be conducted separately for each receptor, based on data on ECOPC concentrations in abiotic media from habitats appropriate for each receptor. Data will be aggregated, as described above from EU or AEU samples, and appropriate EPCs will be calculated. Concentrations at each location will be mapped and compared to RFETS background concentrations to determine whether the Site represents incremental risk.

Figure 7.4 CRA Risk Characterization Process for the Non-PMJM Receptor



If so, additional risk characterization will be performed using additional lines of evidence, such as Site ecological monitoring studies, Draft Watershed ERA data, or other applicable sources to determine whether other data suggest risk.

An analysis of potential data gaps will be conducted for ECOPCs that represent significant risk. If additional data are deemed to be necessary to reduce the uncertainty in the risk analysis to an acceptable level, the types of data will be identified and collected.

For exposure scenarios directed at surface soil, data from no deeper than 6 inches will be used. Surface soil samples in the database include a variety of depth intervals (for example, surface scrape, 0 to 2 inches, and 0 to 6 inches). Whenever available, the depth intervals for surface soil data will be documented for each location to help interpret risk.

Subsurface soil data (from more than 6 inches below the surface) are also available for a variety of depth intervals. Subsurface data will be reviewed for a concentration gradient that increases with depth. In areas where concentrations of ECOPCs are greater in subsurface soil than in surface soil (based on known sources of subsurface contamination), risks will be characterized to burrowing receptors (that is, prairie dog) to the depth at which the increasing concentration gradient ceases or at a maximum depth of 8 feet, whichever is encountered first.

7.4.3 Risk Characterization Process for the Preble's Meadow Jumping Mouse Receptor

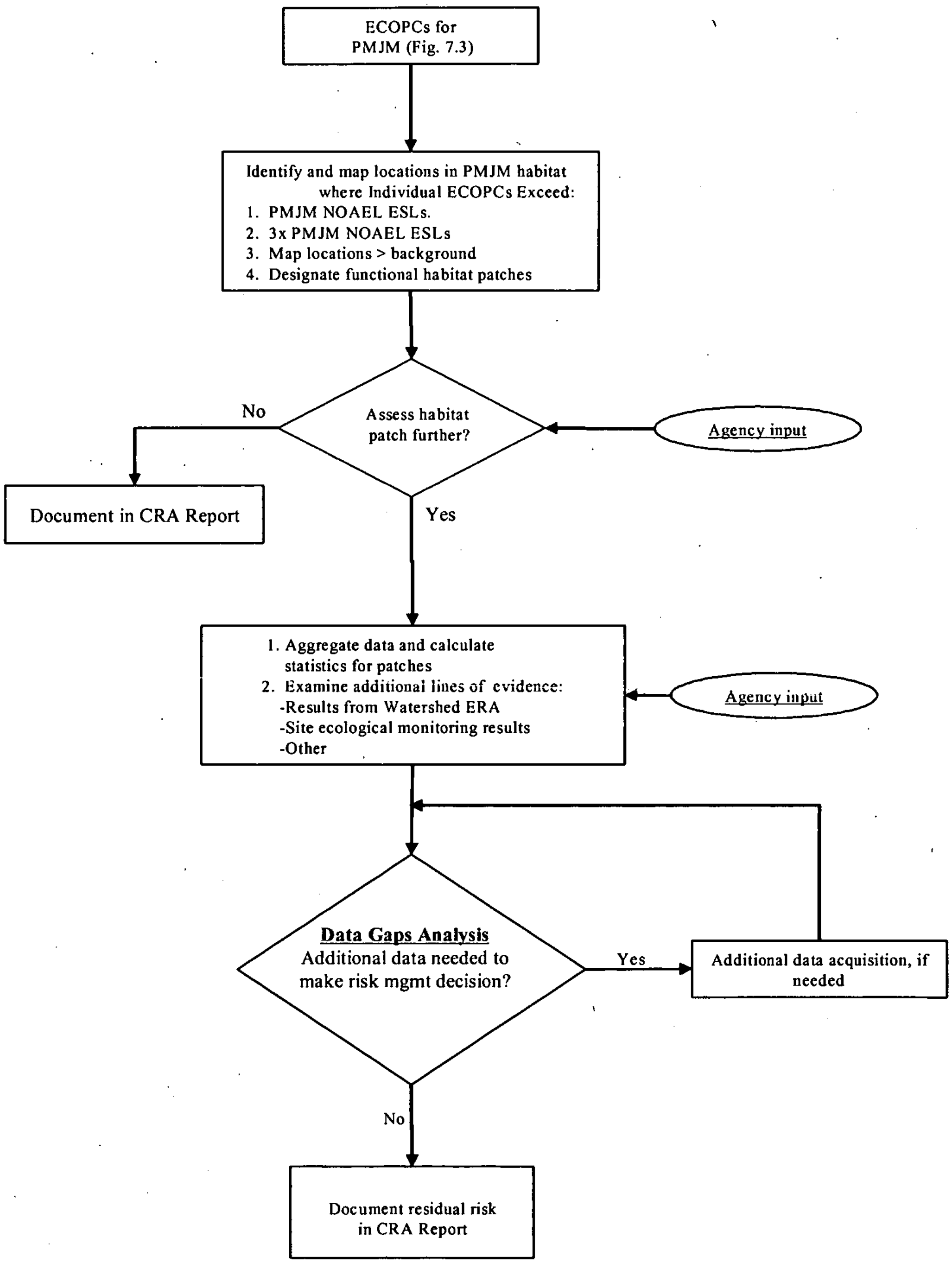
ECOPCs identified for the PMJM receptor (Figure 7.3) will be subjected to a more conservative risk characterization process than those identified in the non-PMJM habitats due to the regulatory status of the PMJM. Section 7.3 discusses the process to be used to determine the list of ECOPCs to be included in the risk characterization for the PMJM (Figure 7.5).

The EUs and PMJM habitat are illustrated on Figure 7.6. PMJM habitat may be modified due to changes in the final configuration of the IA drainages. Appropriate changes to the evaluation of risk to the PMJM will be incorporated through the consultative process with the regulatory agencies. For each ECOPC identified for risk characterization in the PMJM habitats in each EU, maps will be prepared to identify the sampling locations in PMJM habitat for which ECOPC concentrations exceed the NOAEL-based ESLs and display the magnitude of exceedance of the ESL. Geospatial statistical techniques will be employed to visualize the areas of potential risk to the PMJM. These maps will aid in the identification of habitat patches that will be recommended for further assessment. Concentrations will be compared to RFETS background concentrations to determine whether the location represents additional risk above natural conditions.

These maps will be reviewed in consultation with the regulatory agencies to determine whether additional risk characterization is required. The major goal of the first agency input step is to identify patches of habitat that can be primarily used to aggregate data into groupings that could reasonably be expected to represent home ranges of individual PMJM and identify subpopulations. Aggregated data will be used to calculate upper-bound exposure concentrations.

101

Figure 7.5 CRA Risk Characterization Process for the PMJM Receptor



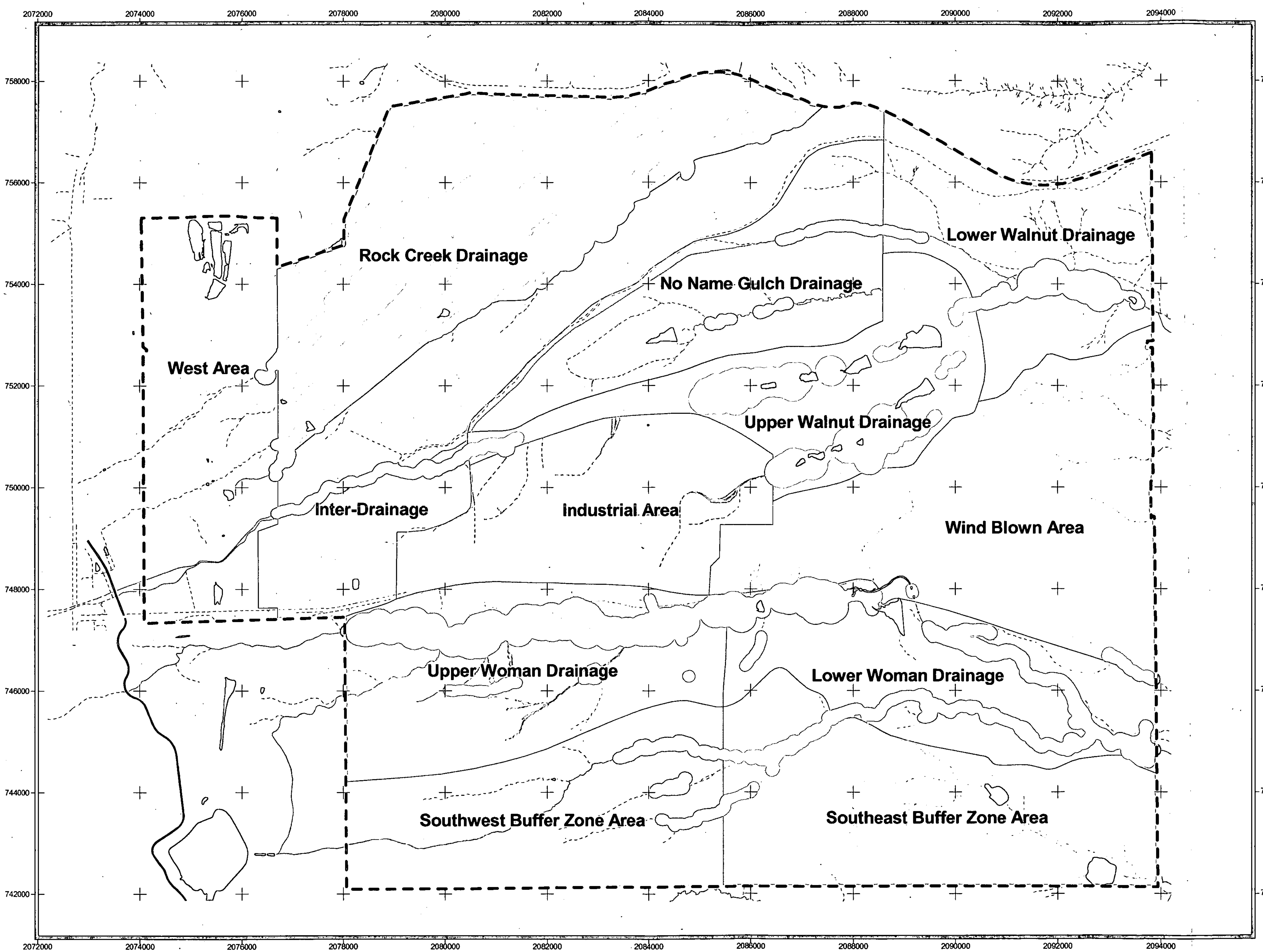


Figure 7.6

Preble's Meadow Jumping Mouse Habitat with Exposure Units

KEY

PMJM protection area

Standard Map Features

Exposure unit boundary

Pond

Site boundary

Perennial stream

Intermittent stream

Ephemeral stream

N W E S

0 1000 2000 Feet

Scale 1:24000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared for: Date: 9/30/05

KAISER•HILL COMPANY

File: W:\Projects\Fy2005\CRA\GIS_Final\ArcView\Methodology\Methodology.apr

103

Based on consultation with the regulatory agencies and best professional judgment, decisions will be made regarding acceptable risk levels for the PMJM. Risks will be categorized as acceptable or unacceptable for the PMJM habitat. The rationale and justification will be documented in the CRA Report. Additional data may also be collected if data gaps are evident. A detailed evaluation of data adequacy will be provided prior to the determination of the potential for risk. The results of this decision point and the uncertainties associated with the potential risk to the PMJM will be discussed in detail in the CRA Report.

7.4.4 Uncertainty

The objective of the uncertainty analysis for the ERA is to identify and characterize the sources of uncertainty, and the potential effects on risk management decisions for the Site. The uncertainty analysis will also identify the methods by which uncertainty for various sources were accounted for in the analysis. These uncertainties are driven by uncertainty in the Site investigation data, likelihood of hypothetical exposure scenarios, transport modes used to estimate concentrations at receptor locations, receptor intake parameters, and toxicity values used to characterize risk.

Sources of uncertainty can be related to systematic and natural variability and lack of precise knowledge regarding key chemical and physical properties. Variable parameters are those that reflect heterogeneity in a well-characterized population, for which the distributions would not generally be narrowed through further measurement or study. Certain parameters reflect a lack of information about the behavior or toxicity of chemicals in the system. The uncertainty analysis for the ERA will be largely qualitative, identifying the primary sources and ranking their potential importance. Quantitative estimates of uncertainty are incorporated through estimates of variability in the data.

Uncertainty will be summarized for the primary components from which different kinds of uncertainty derive: sources of variability (that is, natural and systematic) in data, exposure assessment parameters, uncertainty about ECOPC toxicity thresholds, and the overall risk characterization.

8.0 COMPREHENSIVE RISK ASSESSMENT REPORT ORGANIZATION

The CRA Report will contain 15 volumes. The CRA Report will be included in the RI/FS as an appendix.

- Volume 1 Executive Summary
- 1.0 Introduction
- 2.0 Site Description
- 3.0 Data Evaluation
- 4.0 Human Health Risk Assessment Overview
- 5.0 Ecological Risk Assessment Overview
- Volume 2 Site Description and Data Evaluation
- 1.0 Introduction and Purpose

104

- 2.0 Summary of Comprehensive Risk Assessment Methodology
- 3.0 Summary of the OU 3 Risk Assessment
- 4.0 Sitewide Assessments
- Volume 3 Risk Assessment for the West Area Exposure Unit
- 1.0 The West Area Exposure Unit
- 2.0 Human Health Contaminants of Concern
- 3.0 Human Health Exposure Assessment
- 4.0 Human Health Toxicity Assessment
- 5.0 Human Health Risk Characterization
- 6.0 Uncertainty Analysis
- 7.0 Ecological Contaminants of Potential Concern
- 8.0 Exposure Assessment
- 9.0 Toxicity Assessment
- 10.0 Ecological Risk Characterization
- 11.0 Uncertainty Analysis
- 12.0 Summary and Conclusions
- 13.0 References
- Attachment 1 Detection Limit Screen
- Attachment 2 Data Quality Assessment
- Attachment 3 Statistical Analyses and Professional Judgment
- Attachment 4 CRA Analytical Data Set
- Volume 4 Risk Assessment for the Rock Creek Drainage Exposure Unit
- Volume 5 Risk Assessment for the Inter-Drainage Exposure Unit
- Volume 6 Risk Assessment for the No Name Gulch Drainage Exposure Unit
- Volume 7 Risk Assessment for the Upper Walnut Creek Drainage Exposure Unit
- Volume 8 Risk Assessment for the Lower Walnut Creek Drainage Exposure Unit
- Volume 9 Risk Assessment for the Wind-Blown Area Exposure Unit
- Volume 10 Risk Assessment for the Upper Woman Creek Exposure Unit
- Volume 11 Risk Assessment for the Lower Woman Creek Exposure Unit
- Volume 12 Risk Assessment for the Southwest Buffer Zone Exposure Unit
- Volume 13 Risk Assessment for the Southeast Buffer Zone Exposure Unit
- Volume 14 Risk Assessment for the Industrial Area Exposure Unit

- Volume 15 Risk Assessment for Aquatic Receptors and Wide-Ranging Ecological Receptors

106

8.1 Schedule

The schedule for completion of the Draft CRA is presented in Table 8.1.

Table 8.1 Completion Schedule for the Draft CRA

Task	Description	Dependencies	Deliverable	Completion Date
Complete CRA Work Plan and Methodology (Methodology)	The Methodology guides performance of the CRA. It describes the exposure scenarios and pathways, EUs, DQOs, and exposure assessment methods.	Approval of the Methodology includes screening-level PRGs for the HHRA, and ESLs for the ERA. The ESLs will also be used in the ecological accelerated action screen. The DAR and the start of the CRA depend on approval of the Methodology.	Final CRA Work Plan and Methodology	September 2004
Develop ESLs for ecological receptor	ESLs are being developed for the analytes listed on Table 3 of Attachment 5 of RFCA.	Performance of the ERA, as well as accelerated actions, depends on completion of the ESLs.	Draft Ecological ESL Methodology	August 2004
Complete data adequacy assessment	Existing data will be analyzed spatially to determine whether additional targeted sampling is required to support the CRA.	Completion of the data adequacy assessment is required to support completion of the Draft CRA. If the data adequacy assessment shows that targeted sampling is required, an addendum to the IABZSAP will be developed to support a sampling effort during the spring and summer of 2004.	Targeted Sample SAP	October 2004
Prepare ecological accelerated action screen	Site data will be screened for accelerated action using ecological assessment endpoints.	Accelerated actions must be completed so residual risk can be characterized.	None	December 2004
Develop a draft annotated outline of the Draft CRA	The outline will follow the format included in the Draft CRA Methodology. It will describe, in brief form, information that will be included in the Draft CRA.	Subsequent input to the Draft CRA will conform to the annotated outline. It will also be used for the Preliminary Draft RI/FS.	Draft CRA Annotated Outline	August 2004
Complete HHRA/ERA of one EU	Data currently being collected for the 30-acre grid sampling will be used to perform a complete assessment of one of the EUs on the western side of RFETS.	This assessment will be included in the Preliminary Draft RI/FS.	Draft risk assessment of one EU	October 2004
Complete HHRA/ERA for two additional EUs	Data currently being collected for the 30-acre grid sampling will be used to perform assessments for	The results will be included in the Draft RI/FS.	Draft risk assessment of two EUs	December 2004

108

Table 8.1 Completion Schedule for the Draft CRA

Task	Description	Dependencies	Deliverable	Completion Date
	two additional EUs			
Complete human health assessment for remaining EUs	Additional EUs will be made available for review as they are completed.	All accelerated actions must be completed in the OU; data gap analysis is complete and confirms data adequacy for both human health and ecological receptors.	Draft risk assessments of remaining EUs	November 2004 – July 2005
Complete the Draft CRA	This includes the complete analysis of ecological and human health risk for all EUs from contamination remaining following remedial actions. The assessment will be performed progressively with interim deliverables to be determined but sufficient that the agencies can review analyses prior to issuance of the Draft CRA.	Completion of the Draft CRA requires analysis of the human health and ecological exposure pathways across all EUs. Also, remediation and confirmation sampling needs to be completed to the extent determined adequate by DOE.	Draft CRA	September 2005

9.0 REFERENCES

Crump, K.S., H.A. Guess, and K.L. Deal, 1977, "Confidence intervals and tests of hypotheses concerning dose response relations inferred from animal carcinogenicity data," *Biometrics*, Vol. 33, pp. 437-451.

DOE, 1993, Background Geochemical Characterization Report, U.S. Department of Energy, Rocky Flats Plant, September.

DOE, 1995a, Final Geochemical Characterization of Background Surface Soils: Background Soils Characterization Program, U.S. Department of Energy, Rocky Flats Environmental Technology Site, Golden, Colorado, May.

DOE, 1995b, Draft Final Phase I RFI/RI Report, Woman Creek Priority Drainage Operable Unit No. 5, U.S. Department of Energy, Rocky Flats Environmental Technology Site, Golden, Colorado, Appendix N, October.

DOE, 1996a, Final RFI/RI Report, OU 3 Offsite Areas, U.S. Department of Energy, Rocky Flats Environmental Technology Site, Golden, Colorado, June.

DOE, 1996b, Final Ecological Risk Assessment Methodology: Technical Memorandum Ecological Chemicals of Concern (ECOCs) Screening Methodology, U.S. Department of Energy, Rocky Flats Environmental Technology Site, Golden, Colorado, June.

DOE, 1996c, Final Ecological Risk Assessment Methodology: Technical Memorandum Sitewide Conceptual Model, U.S. Department of Energy, Rocky Flats Environmental Technology Site, Golden, Colorado, June.

DOE, 1997, Corrective Action Decision/Record of Decision, Operable Unit 3, Offsite Areas, Rocky Flats Environmental Technology Site, Golden, Colorado, April.

DOE, 2000, Draft Comprehensive Risk Assessment Methodology, Rocky Flats Environmental Technology Site, Golden, Colorado, September.

DOE, 2001, Industrial Area Sampling and Analysis Plan, Rocky Flats Environmental Technology Site, Golden, Colorado, June.

DOE, 2002a, Final Work Plan for the Development of the Remedial Investigation and Feasibility Study Report, Kaiser-Hill Company, L.L.C., Golden, Colorado, March.

DOE, 2002b, Final Buffer Zone Sampling and Analysis Plan, Rocky Flats Environmental Technology Site, Golden, Colorado, June.

DOE, 2003a, Final Human Health Risk Assessment for the Solar Evaporation Ponds at the Rocky Flats Environmental Technology Site, Golden, Colorado, February.

DOE, 2003b, RESRAD-BIOTA Code, available at http://homer.ornl.gov/oepa/public/bdac.

DOE, 2004a, Industrial Area and Buffer Zone Sampling and Analysis Plan, Rocky Flats Environmental Technology Site, Golden, Colorado, May.

DOE, 2004b, Comprehensive Risk Assessment Sampling and Analysis Plan Addendum 04-01 Phase 1, Rocky Flats Environmental Technology Site, Golden, Colorado, March.

DOE, EPA, and CDPHE, 1996, Rocky Flats Cleanup Agreement, Joint Agreement between the U.S. Department of Energy, U.S. Environmental Protection Agency, Colorado Department of Public Health and Environment, and the State of Colorado, July 19.

DOE, EPA, and CDPHE, 2004, Memorandum to the Comprehensive Risk Assessment Working Group, 04-DOE-00176, March 9.

EPA, 1988, Federal Guidance Document No. 11, Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion, Office of Radiation Programs, EPA/520/1-88/020, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1989, Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A), EPA 154011-891002, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1991, Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part B) Development of Risk-Based Preliminary Remediation Goals), EPA 9285.7-01B.

EPA, 1992a, Guidance for Data Usability in Risk Assessment (Part A), 9285.7-09A PB92-963356, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C., April.

EPA, 1992b, Guidance for Data Usability in Risk Assessment (Part B), 9285.7-09A PB92-963362, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C., May.

EPA, 1992c, Guidelines for Exposure Assessment, Federal Register, Vol. 57, No. 104, U.S. Environmental Protection Agency, Washington, D.C., May.

EPA, 1993, Federal Guidance Document No. 12, External Exposure to Radionuclides in Air, Water, and Soil, EPA-402-R-93-081, U.S. Environmental Protection Agency, Washington, D.C., September.

EPA, 1994, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), September.

EPA, 1997a, U.S. Environmental Protection Agency, Health Effects Assessment Summary Tables, FY1997 Annual, Office of Solid Waste and Emergency Response, EPA/540/R-97/036, Washington, D.C., July.

EPA, 1997b, Ecological Risk Assessment for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final, U.S. Environmental Protection Agency, Washington, D.C, July.

EPA, 1999, Screening Level Ecological Risk Assessment Protocol For Hazardous Waste Combustion Facilities, Peer Review Draft, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C.

110

EPA, 2000a, Guidance for the Data Quality Objectives Process, EPA QA/G-4, EPA/600/R-96/055, Office of Environmental Information, U.S. Environmental Protection Agency, Washington, D.C., August.

EPA, 2000b, Guidance for Data Quality Assessment: Practical Methods for Data Analysis, QA/G-9, EPA/600-R-96/084, U.S. Environmental Protection Agency, Washington, D.C., September.

EPA, 2000c, Ecological Soil Screening Level Guidance (Draft), Office of Emergency and Remedial Response, July.

EPA, 2001a, Health Effects Assessment Summary Tables (HEAST) for Radionuclides, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 2001b, Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Interim, EPA/540/R99/005, OSWER 9285.7-02EP, PB99-963312, September.

EPA, 2001c, Risk Assessment Guidance for Superfund: Volume III – Part A, Process for Conducting Probabilistic Risk Assessment, EPA 540-R-02-002, OSWER 9285.7-45.

EPA, 2002a, Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites, OSWER 9285.6-10, U.S. Environmental Protection Agency, Washington, D.C., December.

EPA, 2002b, Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites, EPA 540-R-01-003, OSWER 9285.7-41, U.S. Environmental Protection Agency, Washington, D.C., September.

EPA, 2003a, Memorandum on Human Health Toxicity Values in Superfund Risk Assessments, OSWER Directive #9285.7-53, Office of Superfund Remediation and Technology Innovation, Washington, D.C., December.

EPA, 2003b, Risk-Based Concentration Tables, Environmental Protection Agency, Region 3, October.

EPA, 2003c, Guidance for Developing Ecological Soil Screening Levels, OSWER Directive #9285.7-55, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Cincinnati, Ohio, November.

EPA, 2004a, Integrated Risk Information System, Online Database, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio.

EPA, 2004b, EPA Region 3 Risk-Based Concentrations, Washington, D.C., April.

EPA, CDPHE, and DOE, 2002, Task 3 Report and Appendices: Calculation of Surface Radionuclide Soil Action Levels for Plutonium, Americium, and Uranium, Rocky Flats Environmental Technology Site, Golden, Colorado, September.

Gilbert, R.O., 1987, *Statistical Methods for Environmental Pollution Monitoring*, New York: Van Nostrand Reinhold.

111

Higley, K. and R. Kuperman, 1995, Radiological Benchmarks for Wildlife at Rocky Flats Environmental Technology Site, March.

ICRP, 1975, Report on the Task Group on Reference Man, International Commission on Radiological Protection, Publication 23.

Insightful Corporation, 2002, S-Plus 6 for Windows, Seattle, Washington.

Jefferson County, 1996, Data provided by Jefferson County Department of Open Space from surveys performed in 1996, Jefferson County, Colorado.

K-H, 2003, GR04-A.4, BOA Implementation Requirements, Rocky Flats Environmental Technology Site, Golden, Colorado, November.

MIDEQ, 2003, Michigan Department of Environmental Quality, Rule 57 Water Quality Values, February.

NAS, 2000, Dietary Reference Intake Series 1997-2001, Subcommittees on Upper Reference Levels of Nutrients and Interpretation and Uses of DRIs, Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food and Nutrition Board. Upper limits (ULs) developed from RDI by the U.S. Food and Drug Administration.

NAS, 2002, Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc (800 pp.), Panel on Micronutrients, Subcommittees on Upper Reference Levels of Nutrients and of Interpretation and Use of Dietary Reference Intakes, and the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes.

NCRP, 1985, General Concepts for the Dosimetry of Internally Deposited Radionuclides, National Council on Radiation Protection and Measurement, NCRP Report.

NRC, 1997, Multi-Agency Radiological Survey and Site Investigation Manual (MARSSIM) Report, Nuclear Regulatory Commission.

ORNL, 1994, Toxicological Benchmarks for Screening Contaminants of Potential Concern, 1994 Revision, Oak Ridge National Laboratory.

PRC, 1998, Draft Technical Memorandum: Development of Toxicity Reference Values, as part of a Regional Approach for Conducting Ecological Risk Assessment at Naval Facilities in California, PRC Environmental Management, Inc., Prepared for the U.S. Department of Navy.

Sample, B.E., D.M. Opresko, and G.W. Suter, 1996, Toxicological Benchmarks for Wildlife, 1996 Revision, Prepared for the DOE, Oak Ridge National Laboratory, ES/ER/TM-86/R3.

Singh, A., A.K. Singh, and R.W. Maichle, 2004, ProUCL Version 3.0 Users Guide, Las Vegas, Nevada, April.

Suter, G.W., II, ed., 1993, Ecological Risk Assessment, Boca Raton: Lewis Publishers.

Trujillo, K. A., and A. B. Chinn, 1996, Ethanol, Drugs and the Brain, California State University, online http://www.csusm.edu/DandB/Ethanol.html.

USFWS, 2004, Rocky Flats Wildlife Refuge Comprehensive Conservation Plan, Volume 3, February.

Appendix A

APPENDIX A

Human Health Screening-Level Preliminary Remediation Goals

114

TABLE OF CONTENTS

LIST OF TABLES

115

ACRONYMS

CAS	Chemical Abstract Service
CDPHE	Colorado Department of Public Health and Environment
COC	contaminant of concern
CRA	Comprehensive Risk Assessment
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
EU	exposure unit
HQ	hazard quotient
g/mg	grams per milligram
IGD	Implementation Guidance Document
PRG	preliminary remediation goal
RfD	reference dose
RFETS or Site	Rocky Flats Environmental Technology Site
RMA	Rocky Mountain Arsenal
VF	volatilization factor
WRW	wildlife refuge worker
RFCA	Rocky Flats Cleanup Agreement

116

UNIT DESCRIPTIONS

95UCL	upper confidence limit of the mean at a 95 percent level
°C	degrees Celsius (or Centigrade)
cm	centimeter
cm^2	square centimeter
cm^3	cubic centimeter
cm^3/cm^3	cubic centimeter per cubic centimeter
day/yr	days per year
ft	foot
g/kg	grams per kilogram
g/mg	grams per milligram
hr	hour
hr/day	hours per day
kg	kilogram
kg/m^3	kilograms per cubic meter
kg/mg	kilograms per milligram
L/day	liters per day
L/hr	liters per hour
m	meter
m^3	cubic meter
$m^3/\mu g$	cubic meters per microgram
m^3/day	cubic meters per day
m^3/hr	cubic meters per hour
m^3/kg	cubic meters per kilogram
m^3-yr/kg-day	cubic meter-year per kilogram-day
mg/cm^2	milligrams per square centimeter
mg/cm^2-event	milligrams per square centimeter-event
mg/day	milligrams per day
mg/kg	milligrams per kilogram

117

UNIT DESCRIPTIONS

mg/kg-day	milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$	one divided by (mg/kg-day)
mg/kg BW/day	milligrams per kilogram per body weight per day
$mg/kg\ BW/day^{-1}$	one divided by (mg/kg BW/day)
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
mg-yr/kg-day	milligram-year per kilogram per day
pCi	picocurie
pCi/g	picocuries per gram
pCi/L	picocuries per liter
%	percent
rad/day	rad per day
risk/pCi	risk per picocurie
risk/yr/pCi/g	risk per year per picocurie per gram
risk/(mg/kg-day)	risk per milligrams per kilogram-day
yr	year
yr/pCi/g	years per picocurie per gram
yr-pCi/g	year-picocurie per gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter

118

1.0 INTRODUCTION

Human health-based screening-level preliminary remediation goals (PRGs) have been developed for the wildlife refuge worker (WRW) for organics, inorganics, and radionuclides in surface soil, subsurface soil, surface water, and groundwater (volatilization pathway). These PRGs will support the selection of human health contaminants of concern (COCs) in exposure units (EUs) for the Draft Comprehensive Risk Assessment (CRA) for the Rocky Flats Environmental Technology Site (RFETS or Site). The PRGs for surface soil presented in the Rocky Flats Cleanup Agreement (RFCA) Appendix N of Appendix 3, Implementation Guidance Document (IGD) (DOE et al. 1996 [as modified]), were used as the basis for the PRGs to be used in the CRA. Specifically, the following sets of PRGs were developed:

- The PRGs for organics, inorganics, and radionuclides in surface soil for the WRW presented here are different from those presented in RFCA, IGD, Appendix N (DOE et al. 1996 [as modified]), due to reduced exposure frequency to surface soil. The PRGs are based on ingestion, inhalation, and external exposure from surface soil. These PRGs will support the development of surface soil and sediment COCs for the CRA.

- Screening-level PRGs for organics, inorganics, and radionuclides in subsurface soil using the WRW exposure scenario. The PRGs are based on the ingestion, inhalation, and external exposure from subsurface soil. These PRGs will support the development of subsurface soil COCs for the CRA.

- Screening-level PRGs for organics, inorganics, and radionuclides in surface water using the WRW exposure scenario. The PRGs are based on the ingestion of surface water. These PRGs will support an assessment of the surface water ingestion pathway, including groundwater contributions and COCs for the CRA.

- Screening-level PRGs for volatile organics in subsurface soil and groundwater using the WRW exposure scenario. The PRGs being derived are based on the inhalation of volatile organics from subsurface soil and groundwater. These PRGs will support an assessment of volatile organics in subsurface soil and groundwater and COCs for the CRA.

The following sections further discuss the derivation of the screening-level PRGs, along with the applicable exposure parameters, PRG equations, and PRG values. The screening-level PRGs were derived using these PRG equations with the applicable PRG parameters. A description of the derivation of the surface soil PRGs is presented in RFCA, IGD, Appendix N. Toxicity factors, including inhalation and ingestion slope factors and reference doses (RfDs), are also found in Appendix N.

1.1 Surface Soil Screening-Level Preliminary Remediation Goals

The WRW surface soil exposure scenario consists of the following pathways: ingestion of surface soil, inhalation of dust (outdoors), and dermal contact for nonradionuclides for a WRW working at the Site for an average of 18.7 years, spending 230 days per year, 4 hours per day exposed to surface soil. The outdoor inhalation pathway is assessed for volatiles as released from the soil and nonvolatiles released as fugitive dust. The scenario assumes the worker will be performing soil contact-intensive activities. This scenario includes all

119

complete and significant exposure pathways included in the site conceptual model and parameter assumptions that were evaluated in the Task 3 Report and Appendices: Calculation of Surface Radionuclide Soil Action Levels for Plutonium, Americium, and Uranium (EPA et al. 2002). The values calculated for radionuclides in the Task 3 report were used without modification. For all other analytes, the exposure time was reduced from 250 days per year to 230 days per year to account for 20 days of subsurface soil exposure (Section 1.2). PRGs were calculated for both a 1 x 10^{-6} risk and a hazard quotient (HQ) of 0.1. The more conservative of the two values is chosen for the PRG.

1.1.1 Surface Soil Preliminary Remediation Goal Parameters

The PRG parameters listed in Table A-1 were used to derive PRGs using the equations presented in Section 1.1.2.

Table A-1
PRG Parameters for Surface Soil Screen

Exposure Parameter	Variable	Unit	Point Estimate	Source
Target hazard index	THI	--	0.1	EPA 1991a
Target excess lifetime cancer risk	TR	--	1E-06	EPA 1991a
Adult body weight	BWa	kg	70	EPA 1991b
Averaging time - noncarcinogenic	ATnc	yr	18.7	EPA et al. 2002
Averaging time - carcinogenic	ATc	yr	70	EPA 1991b
Exposure frequency	EFwss	day/yr	230	EPA et al. 2002[a]
Exposure duration	EDw	yr	18.7.	EPA et al. 2002
Exposure time	ETo_w	hr/day	8	EPA et al. 2002
Hourly inhalation rate (adult worker)	IRaw	m^3/hr	1.30	EPA 1997
Mass loading, (PM10) for inhalation	MLF	kg/m^3	6.7 E-8	EPA et al. 2002
Site-specific PEF based on ML	PEF	m^3/kg.	14925373	EPA et al. 2002
Soil ingestion rate	IRwss	mg/day	100	EPA 1991b
Exposure time fraction, outdoor - on Site	ETFo_w	--	0.5	EPA et al. 2002
Exposure time fraction, indoor - on Site	ETFi_w	--	0	
WRW skin-soil adherence factor	AFw	mg/cm^2-event	0.117	EPA 2001
Event frequency	EVw	events/day	1	EPA 2001
WRW skin surface area	SAw	cm^2	3300	EPA 2001
Dermal absorption fraction	ABS	--	chemical-specific	
Gamma shielding factor (1-Se)	GSF	--	1	EPA et al. 2002
Area correction factor	ACF	--	0.9	EPA et al. 2002
Oral reference dose	RfDo	mg/kg-day	chemical-specific	
Oral cancer slope factor	CSFo	$(mg/kg\text{-}day)^{-1}$	chemical-specific	
Inhalation reference dose	RfDi	mg/kg-day	chemical-specific	
Inhalation cancer slope factor	CSFi	$(mg/kg\text{-}day)^{-1}$	chemical-specific	
Oral cancer slope factor - radionuclides	CSFsoil	risk/pCi	radionuclide-specific	
External cancer slope factor - radionuclides	CSFe	risk/yr/pCi/g	radionuclide-specific	

a - The value of 250 days per year used in the Task 3 Report (EPA et al. 2002) has been adjusted to 230 days to account for the 20 day exposure to subsurface soil.

1.1.2 Surface Soil Preliminary Remediation Goal Equations

The following equations were used to derive the surface soil PRG values:

120

Noncarcinogenic Preliminary Remediation Goal =

((THI x ATnc(yr) x 365(day/yr)) / (IRwss(mg/day) x EFwss(day/yr) x EDw(yr) x 10^{-6} (kg/mg) x 1/RfDo(mg/kg-day) x 1/BWa(kg))) + (IRaw(m^3/hr) x EFwss(day/year) x EDw(yr) x ETo_w(hr/day) x 1/PEF (m^3/kg) x 1/RfDi(mg/kg-day) x 1/BWa(kg) x (ETFo_w + (ETFi_w))) + (SAw(cm^2) x AFw(mg/cm^2-event) x EFwss(day/yr) x EDw(yr) x ABS x EVw(events/day) x 1/RfDo(mg/kg-day) x 10^{-6}(kg/mg) x 1/BWa(kg))

Carcinogenic Preliminary Remediation Goal =

((TR x ATc(yr) x 365(day/yr)) / (IRwss(mg/day) x EFwss(day/yr) x EDw(yr) x 10^{-6} (kg/mg) x CSFo(risk/mg/kg-day) x 1/BWa(kg))) + (IRaw(m^3/hr) x EFwss(day/yr) x EDw(yr) x ETo_w(hr/day) x 1/PEF (m^3/kg) x CSFi(risk/mg/kg-day) x 1/BWa(kg) x (ETFo_w + (ETFi_w))) + (SAw(cm^2) x AFw(mg/cm^2-event) x EFwss(day/yr) x EDw(yr) x ABS x EVw(events/day) x CSFo(risk/mg/kg-day) x 10^{-6}(kg/mg) x 1/BWa(kg))

Radionuclide Carcinogenic Preliminary Remediation Goal =

(TR / (IRwss(mg/day) x CSFsoil(risk/pCi) x 10^{-3}(g/mg) x EFwss(day/yr) x EDw(yr)) + (IRaw(m^3/hr) x 1/PEF(m^3/kg) x CSFi(risk/pCi) x 1000(g/kg) x EFwss(day/yr) x EDw(yr) x ETo_w(hr/day) x (ETFo_w + ETFi_w))) + (CSFe(risk/yr/pCi/g) x EF_wss(day/yr)/365(day/yr) x ETo_w(hr/day)/24 x ED_w(yr) x ACF) x ETFo_w x GSF

1.1.3 Surface Soil Screening-Level Preliminary Remediation Goal Values

Table A - 2 presents the surface soil screening-level PRG values.

Table A-2
WRW Surface Soil Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Soil PRG HQ = 0.1	WRW Carcinogenic Soil PRG Risk = 1E-06	WRW Soil PRG Risk = 1E-06 or HQ = 0.1	Units
1,1,1,2-Tetrachloroethane	630-20-6	3332609	91018	91018	ug/kg
1,1,1-Trichloroethane	71-55-6	9178628		9178628	ug/kg
1,1,2,2-Tetrachloroethane	79-34-5	6665217	10483	10483	ug/kg
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	2383408104		2383408104	ug/kg
1,1,2-Trichloroethane	79-00-5	444348	28022	28022	ug/kg
1,1-Dichloroethane	75-34-3	2715777		2715777	ug/kg
1,1-Dichloroethene [a]	75-35-4	17366		17366	ug/kg
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7		0.48	0.48	ug/kg
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3		0.48	0.48	ug/kg
1,2,3-Trichloropropane	96-18-4	158872	2079	2079	ug/kg
1,2,4,5-Tetrachlorobenzene	95-94-3	24043		24043	ug/kg
1,2,4-Trichlorobenzene	120-82-1	151360		151360	ug/kg
1,2,4-Trimethylbenzene	95-63-6	132620		132620	ug/kg
1,2-Dibromo-3-chloropropane	96-12-8	17931	2968	2968	ug/kg
1,2-Dichlorobenzene (o-)	95-50-1	2891221		2891221	ug/kg
1,2-Dichloroethane	107-06-2	61872	13270	13270	ug/kg
1,2-Dichloroethene (cis-)	156-59-2	1110870		1110870	ug/kg
1,2-Dichloroethene (total)	540-59-0	999783		999783	ug/kg
1,2-Dichloroethene (trans-)	156-60-5	287340		287340	ug/kg

121

Table A-2
WRW Surface Soil Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Soil PRG HQ = 0.1	WRW Carcinogenic Soil PRG Risk = 1E-06	WRW Soil PRG Risk = 1E-06 or HQ = 0.1	Units
1,2-Dichloropropane	78-87-5	38427	61152	38427	ug/kg
1,2-Diphenylhydrazine	122-66-7		3741	3741	ug/kg
1,3,5-Trimethylbenzene	108-67-8	114340		114340	ug/kg
1,3-Dichlorobenzene	541-73-1	3332609		3332609	ug/kg
1,3-Dichloropropene	542-75-6	76174	19432	19432	ug/kg
1,4-Dichlorobenzene (p-)	106-46-7	2953141	91315	91315	ug/kg
1,4-Dioxane	123-91-1		378030	378030	ug/kg
2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	93-65-2	80144		80144	ug/kg
2,3,4,6-Tetrachlorophenol	58-90-2	2404306		2404306	ug/kg
2,4,5-T	93-76-5	801440		801440	ug/kg
2,4,5-Trichlorophenol	95-95-4	8014354		8014354	ug/kg
2,4,6-Trichlorophenol	88-06-2		272055	272055	ug/kg
2,4,6-Trinitrotoluene	118-96-7	40072	100001	40072	ug/kg
2,4-Dichlorophenol	120-83-2	240431		240431	ug/kg
2,4-Dimethylphenol	105-67-9	1602871		1602871	ug/kg
2,4-Dinitrophenol	51-28-5	160287		160287	ug/kg
2,4-Dinitrotoluene	121-14-2	160287		160287	ug/kg
2,6-Dinitrotoluene	606-20-2	80144		80144	ug/kg
2-Butanone (methyl ethyl ketone)	78-93-3	46373332		46373332	ug/kg
2-Chloronaphthalene	91-58-7	6411483		6411483	ug/kg
2-Chlorophenol	95-57-8	555435		555435	ug/kg
2-Chlorotoluene	95-49-8	2221740		2221740	ug/kg
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	94-74-6	40072		40072	ug/kg
2-Methylnaphthalene	91-57-6	320574		320574	ug/kg
2-Methylphenol (o-cresol)	95-48-7	4007177		4007177	ug/kg
2-Nitroaniline	88-74-4	192137		192137	ug/kg
3,3-Dichlorobenzidine	91-94-1		6667	6667	ug/kg
4-(2,4-Dichlorophenoxy) butyric acid (2,4-DB)	94-82-6	641148		641148	ug/kg
4,4-DDD	72-54-8		15528	15528	ug/kg
4,4-DDE	72-55-9		10961	10961	ug/kg
4,4-DDT	50-29-3	49778	10927	10927	ug/kg
4,6-Dinitro-2-methylphenol (4,6-dinitro-o-cresol)	534-52-1	8014		8014	ug/kg
4-Chloro-3-methylphenol	59-50-7				ug/kg
4-Chloroaniline	106-47-8	320574		320574	ug/kg
4-Methyl-2-pentanone (methyl isobutyl ketone)	108-10-1	83210223		83210223	ug/kg
4-Methylphenol (p-cresol)	106-44-5	400718		400718	ug/kg
4-Nitroanaline	100-01-6	329814	207917	207917	ug/kg
4-Nitrophenol	100-02-7	641148		641148	ug/kg
Acenaphthene	83-32-9	4437768		4437768	ug/kg
Acenaphthylene	208-96-8				ug/kg
Acetone	67-64-1	99978261		99978261	ug/kg
Acrolein	107-02-8	428		428	ug/kg
Acrylonitrile	107-13-1	30479	4622	4622	ug/kg
Alachlor	15972-60-8	801435	37500	37500	ug/kg
Aldicarb	116-06-3	80144		80144	ug/kg

132

Table A-2
WRW Surface Soil Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Soil PRG HQ = 0.1	WRW Carcinogenic Soil PRG Risk = 1E-06	WRW Soil PRG Risk = 1E-06 or HQ = 0.1	Units
Aldicarb sulfone	1646-88-4	80144		80144	ug/kg
Aldicarb sulfoxide	1646-87-3				ug/kg
Aldrin	309-00-2	2404	176	176	ug/kg
Aluminum	7429-90-5	24774		24774	mg/kg
Ammonium (as ammonia)	7664-41-7	910997		910997	mg/kg
Anthracene	120-12-7	22188842		22188842	ug/kg
Antimony	7440-36-0	44.4		44.4	mg/kg
Aroclor 1016	12674-11-2	5048	1349	1349	ug/kg
Aroclor 1221	11104-28-2		1349	1349	ug/kg
Aroclor 1232	11141-16-5		1349	1349	ug/kg
Aroclor 1242	53469-21-9		1349	1349	ug/kg
Aroclor 1248	12672-29-6		1349	1349	ug/kg
Aroclor 1254	11097-69-1	1442	1349	1349	ug/kg
Aroclor 1260	11096-82-5		1349	1349	ug/kg
Arsenic	7440-38-2	30	2.41	2.41	mg/kg
Atrazine	1912-24-9	2805024	13636	13636	ug/kg
Barium	7440-39-3	2872		2872	mg/kg
Benzene	71-43-2	144433	23563	23563	ug/kg
Benzidine	92-87-5	240431	13.0	13.0	ug/kg
Benzo(a)anthracene	56-55-3		3793	3793	ug/kg
Benzo(a)pyrene	50-32-8		379	379	ug/kg
Benzo(b)fluoranthene	205-99-2		3793	3793	ug/kg
Benzo(g,h,i)perylene	191-24-2				ug/kg
Benzo(k)fluoranthene	207-08-9		37927	37927	ug/kg
Benzoic Acid (at pH 7)	65-85-0	320574148		320574148	ug/kg
Benzyl Alcohol	100-51-6	24043061		24043061	ug/kg
Beryllium	7440-41-7	100	142	100	mg/kg
bis(2-chloroethyl)ether	111-44-4		3767	3767	ug/kg
bis(2-chloroisopropyl)ether	108-60-1	4443478	59301	59301	ug/kg
bis(2-ethylhexyl)phthalate	117-81-7	1602871	213750	213750	ug/kg
Boron	7440-42-8	9477		9477	mg/kg
Bromodichloromethane	75-27-4	2221739	67070	67070	ug/kg
Bromoform	75-25-2	2221739	419858	419858	ug/kg
Bromomethane (methyl bromide)	74-83-9	20959		20959	ug/kg
Butylbenzylphthalate	85-68-7	16028707		16028707	ug/kg
Cadmium (food)	7440-43-9	91.4	189	91.4	mg/kg
Carbazole	86-74-8		150001	150001	ug/kg
Carbofuran	1563-66-2	400718		400718	ug/kg
Carbon disulfide	75-15-0	1637032		1637032	ug/kg
Carbon tetrachloride	56-23-5	8446	8637	8446	ug/kg
Chlordane-alpha	5103-71-9	47753	10261	10261	ug/kg
Chlordane-beta	5103-74-2	47753	10261	10261	ug/kg
Chlordane-gamma	12789-03-6	47753	10261	10261	ug/kg
Chlorobenzene	108-90-7	666523		666523	ug/kg
Chloroethane (ethyl chloride)	75-00-3	7092413	1433909	1433909	ug/kg
Chloroform	67-66-3	194871	7850	7850	ug/kg
Chloromethane (methyl chloride)	74-87-3	115077		115077	ug/kg
Chlorpyrifos	2921-88-2	240431		240431	ug/kg
Chromium III	16065-83-1	166630		166630	mg/kg
Chromium VI	18540-29-9	244	28.4	28.4	mg/kg
Chrysene	218-01-9		379269	379269	ug/kg

123

Table A-2
WRW Surface Soil Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Soil PRG HQ = 0.1	WRW Carcinogenic Soil PRG Risk = 1E-06	WRW Soil PRG Risk = 1E-06 or HQ = 0.1	Units
cis-1,3-Dichloropropene	10061-01-5	76174	19432	19432	ug/kg
Cobalt	7440-48-4	168	122	122	mg/kg
Copper	7440-50-8	4443		4443	mg/kg
Cyanide	57-12-5	2222		2222	mg/kg
Cyclohexane	110-82-7	54659810819		54659810819	ug/kg
Dalapon	75-99-0	2404306		2404306	ug/kg
Demeton	8065-48-3	3206		3206	ug/kg
Di(2-ethylhexyl)adipate	103-23-1	48086122	2500021	2500021	ug/kg
Dibenzo(a,h)anthracene	53-70-3		379	379	ug/kg
Dibenzofuran	132-64-9	222174		222174	ug/kg
Dibromochloromethane	124-48-1	2221739	49504	49504	ug/kg
Dicamba	1918-00-9	2404306		2404306	ug/kg
Dichlorodifluoromethane	75-71-8	229820		229820	ug/kg
Dichlorophenoxyacetic acid (2,4-D)	94-75-7	801435		801435	ug/kg
Dieldrin	60-57-1	4007	187	187	ug/kg
Diethyl ether	60-29-7	22217391		22217391	ug/kg
Diethylphthalate	84-66-2	64114830		64114830	ug/kg
Dimethoate	60-51-5	16029		16029	ug/kg
Dimethylphthalate	131-11-3	801435369		801435369	ug/kg
Di-n-butylphthalate	84-74-2	8014354		8014354	ug/kg
Di-n-octylphthalate	117-84-0	3205741		3205741	ug/kg
Dinoseb	88-85-7	80144		80144	ug/kg
Dioxin (TCDD)	1746-01-6		0.025	0.025	ug/kg
Diquat	85-00-7	176316		176316	ug/kg
Endosulfan (technical)	115-29-7	480861		480861	ug/kg
Endosulfan I	959-98-8	480861		480861	ug/kg
Endosulfan II	33213-65-9	480861		480861	ug/kg
Endosulfan sulfate	1031-07-8	480861		480861	ug/kg
Endrin (technical)	72-20-8	24043		24043	ug/kg
Endrin aldehyde	7421-93-4	24043		24043	ug/kg
Endrin ketone	53494-70-5	33326		33326	ug/kg
Ethyl acetate	141-78-6	99978261		99978261	ug/kg
Ethylbenzene	100-41-4	5385973		5385973	ug/kg
Ethylene dibromide (1,2-Dibromoethane)	106-93-4	6470	35.1	35.1	ug/kg
Fluoranthene	206-44-0	2958512		2958512	ug/kg
Fluorene	86-73-7	3205741		3205741	ug/kg
Fluoride (as fluorine)	7782-41-4	6665		6665	mg/kg
Glyphosate	1071-83-6	8014354		8014354	ug/kg
Guthion	86-50-0				ug/kg
Heptachlor	76-44-8	40072	665	665	ug/kg
Heptachlor epoxide	1024-57-3	1042	329	329	ug/kg
Hexachlorobenzene	118-74-1	64115	1870	1870	ug/kg
Hexachlorobutadiene	87-68-3	22217	45428	22217	ug/kg
Hexachlorocyclohexane, alpha (alpha-BHC)	319-84-6		570	570	ug/kg
Hexachlorocyclohexane, beta (beta-BHC)	319-85-7		1995	1995	ug/kg
Hexachlorocyclohexane, delta (delta-BHC)	319-86-8				ug/kg
Hexachlorocyclohexane, gamma (gamma-BHC)	58-89-9	28868	2771	2771	ug/kg

124

Table A-2
WRW Surface Soil Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Soil PRG HQ = 0.1	WRW Carcinogenic Soil PRG Risk = 1E-06	WRW Soil PRG Risk = 1E-06 or HQ = 0.1	Units
Hexachlorocyclohexane, Technical (Lindane)	608-73-1		1995	1995	ug/kg
Hexachlorocyclopentadiene	77-47-4	380452		380452	ug/kg
Hexachlorodibenzo-p-dioxin	34465-46-8		0.48	0.48	ug/kg
Hexachloroethane	67-72-1	111087	257240	111087	ug/kg
Indeno(1,2,3-cd)pyrene	193-39-5		3793	3793	ug/kg
Iron	7439-89-6	33326		33326	mg/kg
Isobutyl alchohol	78-83-1	33326087		33326087	ug/kg
Isophorone	78-59-1	16028707	3157922	3157922	ug/kg
Isopropylbenzene (cumene)	98-82-8	5520778	32680	32680	ug/kg
Lead	7439-92-1	1000		1000	mg/kg
Lithium	7439-93-2	2222		2222	mg/kg
Manganese (food)	7439-96-5	443		443	mg/kg
Mercury	7439-97-6	33		33	mg/kg
Methoxychlor	72-43-5	400718		400718	ug/kg
Methyl methacrylate	80-62-6	12423348		12423348	ug/kg
Methyl tert-butyl ether	1634-04-4	38170968	750006	750006	ug/kg
Methylene chloride (dichloromethane)	75-09-2	5004282	271792	271792	ug/kg
Mirex	2385-85-5	16029		16029	ug/kg
Molybdenum	7439-98-7	555		555	mg/kg
m-p-Xylene	136777-61-2	1059049		1059049	ug/kg
m-Xylene	108-38-3	1059049		1059049	ug/kg
Naphthalene	91-20-3	1403301		1403301	ug/kg
Nickel (soluble)	7440-02-0	2222		2222	mg/kg
Nitrate	14797-55-8	177739		177739	mg/kg
Nitrite	14797-65-0	11109		11109	mg/kg
Nitrobenzene	98-95-3	43246		43246	ug/kg
N-Nitrosodiethylamine	55-18-5		19.9	19.9	ug/kg
N-Nitrosodimethylamine	62-75-9	641	58.7	58.7	ug/kg
N-Nitroso-di-n-butylamine	924-16-3		520	520	ug/kg
N-Nitrosodi-N-propylamine	621-64-7		429	429	ug/kg
N-Nitrosodiphenylamine	86-30-6	1602871	612250	612250	ug/kg
N-Nitrosopyrrolidine	930-55-2		1425	1425	ug/kg
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	4007177		4007177	ug/kg
Oxamyl (vydate)	23135-22-0	2003588		2003588	ug/kg
o-Xylene	95-47-6	1059049		1059049	ug/kg
Parathion	56-38-2	480861		480861	ug/kg
Pentachlorobenzene	608-93-5	64115		64115	ug/kg
Pentachlorophenol	87-86-5	1695768	17633	17633	ug/kg
Phenanthrene	85-01-8				ug/kg
Phenol	108-95-2	24043061		24043061	ug/kg
Picloram	1918-02-1	5610048		5610048	ug/kg
p-Nitrotoluene	99-99-0	1110870	244608	244608	ug/kg
p-Xylene	106-42-3	1059049		1059049	ug/kg
Pyrene	129-00-0	2218884		2218884	ug/kg
Selenium	7782-49-2	555		555	mg/kg
Silver	7440-22-4	555		555	mg/kg
Simazine	122-34-9	400718	25000	25000	ug/kg
Strontium	7440-24-6	66652		66652	mg/kg
Styrene	100-42-5	13789257		13789257	ug/kg
Sulfide	18496-25-8				mg/kg

125

Table A-2
WRW Surface Soil Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Soil PRG HQ = 0.1	WRW Carcinogenic Soil PRG Risk = 1E-06	WRW Soil PRG Risk = 1E-06 or HQ = 0.1	Units
Tetrachloroethene	127-18-4	863641	6705	6705	ug/kg
Tetraethyl dithiopyrophosphate	3689-24-5	40070		40070	ug/kg
Thallium	7440-28-0	7.78		7.78	mg/kg
Tin	7440-31-5	66652		66652	mg/kg
Titanium	7440-32-6	169568		169568	mg/kg
Toluene	108-88-3	3094217		3094217	ug/kg
Toxaphene	8001-35-2		2720	2720	ug/kg
trans-1,3-Dichloropropene	10061-02-6	86794	20820	20820	ug/kg
Trichloroethene [a]	79-01-6	29075	1770	1770	ug/kg
Trichlorofluoromethane	75-69-4	1511019		1511019	ug/kg
Trichlorophenoxyproprionic acid	93-72-1	169369		169369	ug/kg
Uranium (soluble salts)	7440-61-1	333		333	mg/kg
Vanadium	7440-62-2	111		111	mg/kg
Vinyl acetate	108-05-4	2647023		2647023	ug/kg
Vinyl chloride	75-01-4	137661	2169	2169	ug/kg
Xylene (total)	1330-20-7	1059049		1059049	ug/kg
Zinc	7440-66-6	33326		33326	mg/kg
Americium-241	14596-10-2		7.69	7.69	pCi/g
Cesium-134	013967-70-9		0.08	0.08	pCi/g
Cesium-137+D	10045-97-3		0.22	0.22	pCi/g
Curium-244	013981-15-2		8.63	8.63	pCi/g
Curium-245/246	015621-76-8		1.80	1.80	pCi/g
Neptunium-237	013994-20-2		5.43	5.43	pCi/g
Plutonium-236	015411-92-4		9.16	9.16	pCi/g
Plutonium-238	013981-16-3		5.97	5.97	pCi/g
Plutonium-239	15117-48-3		9.78	9.78	pCi/g
Plutonium-240	14119-33-6		9.80	9.80	pCi/g
Plutonium-241	014119-32-5		520.08	520.08	pCi/g
Plutonium-242	13982-10-0		6.24	6.24	pCi/g
Raadium-228+D	15262-20-1		0.11	0.11	pCi/g
Radium-226	13982-63-3		2.69	2.69	pCi/g
Strontium-89	14158-27-1		36.1	36.1	pCi/g
Strontium-90+D	10098-97-2		13.2	13.2	pCi/g
Tritium	10028-17-8		25082	25082	pCi/g
Uranium-232	14158-29-3		3.61	3.61	pCi/g
Uranium-233	13968-55-3		11.4	11.4	pCi/g
Uranium-234	13966-29-5		25.3	25.3	pCi/g
Uranium-235	15117-96-1		1.05	1.05	pCi/g
Uranium-238	7440-61-1		29.3	29.3	pCi/g

a. Values recommended by CDPHE.

1.2 Subsurface Soil Screening-Level Preliminary Remediation Goals

The WRW subsurface soil exposure scenario consists of the following pathways: ingestion of subsurface surface soil, inhalation of dust (outdoors), and dermal contact for nonradionuclides for a WRW working at the Site for an average of 18.7 years, spending 20 days per year (EBASCO 1993), 4 hours per day exposed to subsurface soil. The outdoor inhalation pathway is assessed for volatiles as released from the soil. The inhalation pathway is assessed for nonvolatiles as fugitive dust. The external radiation exposure pathway is also included for radionuclides. The scenario assumes the worker will be performing soil contact-intensive activities. This scenario includes all complete and significant exposure pathways and parameter assumptions that were evaluated in the Task 3 Report and Appendices: Calculation of Surface Radionuclide Soil Action Levels for Plutonium, Americium, and Uranium (EPA et al. 2002). PRGs were calculated for both a 1 x 10^{-6} risk and a HQ of 0.1. The more conservative of the two values is chosen for the PRG.

1.2.1 Subsurface Soil Preliminary Remediation Goal Parameters

The PRG parameters listed in Table A-3 are used to derive PRGs using the equations presented in Section 1.2.2.

Table A-3
PRG Parameters for Subsurface Soil Screen

Exposure Parameter	Variable	Unit	Point Estimate	Source
Target hazard index	THI-1	--	0.1	EPA 1991a
Target excess lifetime cancer risk	TR-1	--	1E-06	EPA 1991a
Adult body weight	BWa	kg	70	EPA 1991b
Averaging time - noncarcinogenic	ATnc	yr	18.7	EPA et al. 2002
Averaging time - carcinogenic	ATc	yr	70	EPA 1991b
Exposure frequency	EFwsubs	day/yr	20	EBASCO 1993
Exposure duration	EDw	yr	18.7	EPA et al. 2002
Exposure time	ETo_w	hr/day	8	EPA et al. 2002
Hourly inhalation rate (adult worker)	IRaw	m^3/hr	1.30	EPA 1997
Mass loading, (PM10) for inhalation	MLF	kg/m^3	6.7 E-08	EPA et al. 2002
Site-specific PEF based on ML	PEF	m^3/kg	14925373	EPA et al. 2002
Soil ingestion rate	IRwss	mg/day	100	EPA 1991b
Exposure time fraction, on site outdoor	ETFo_w	--	0.5	EPA et al. 2002
Exposure time fraction, on site indoor	ETFi_w	--	0	
WRW skin-soil adherence factor	AFw	mg/cm^2-event	0.117	EPA 2001
Event frequency	EVw	events/day	1	EPA 2001
WRW skin surface area	SAw	cm^2	3300	EPA 2001
Dermal absorption fraction	ABS	--	chemical-specific	
Gamma shielding factor (1-Se)	GSF	--	1	EPA et al. 2002
Area correction factor	ACF	--	0.9	EPA et al. 2002
Oral reference dose	RfDo	mg/kg-day	chemical-specific	
Oral cancer slope factor	CSFo	$(mg/kg\text{-}day)^{-1}$	chemical-specific	
Inhalation reference dose	RfDi	mg/kg-day	chemical-specific	
Inhalation cancer slope factor	CSFi	$(mg/kg\text{-}day)^{-1}$	chemical-specific	
Oral soil cancer slope factor - radionuclides	CSFsoil	risk/pCi	radionuclide-specific	
External cancer slope factor - radionuclides	CSFe	risk/yr/pCi/g	radionuclide-specific	

1.2.2 Subsurface Soil Preliminary Remediation Goal Equations

The following equations are used to derive the PRG values:

Noncarcinogenic Preliminary Remediation Goal =

((THI x ATnc(yr) x 365(day/yr)) / (IRwss(mg/day) x EFwsubs(day/yr) x EDw(yr) x 10^{-6} (kg/mg) x 1/RfDo(mg/kg-day) x 1/BWa(kg))) + (IRwss(m^3/hr) x EFwsubs(day/year) x EDw(yr) x ETo_w(hr/day) x 1/PEF (m^3/kg) x 1/RfDi(mg/kg-day) x 1/BWa(kg) x (ETFo_w + (ETFi_w))) + (SAw(cm^2) x AFw(mg/cm^2-event) x EFwsubs(day/yr) x EDw(yr) x ABS x EVw(events/day) x 1/RfDo(mg/kg-day) x 10^{-6}(kg/mg) x 1/BWa(kg))

137

Carcinogenic Preliminary Remediation Goal =

((TR x ATc(yr) x 365(day/yr)) / (IRwss(mg/day) x EFwsubs(day/yr) x EDw(yr) x 10^{-6} (kg/mg) x CSFo(risk/mg/kg-day) x 1/BWa(kg))) + (IRaw(m^3/hr) x EFwsubs(day/yr) x EDw(yr) x ETo_w(hr/day) x 1/PEF (m^3/kg) x CSFi(risk/mg/kg-day) x 1/BWa(kg) x (ETFo_w + (ETFi_w))) + (SAw(cm^2) x AFw(mg/cm^2-event) x EFwsubs(day/yr) x EDw(yr) x ABS x EVw(events/day) x CSFo(risk/mg/kg-day) x 10^{-6}(kg/mg) x 1/BWa(kg))

Radionuclide Carcinogenic Preliminary Remediation Goal =

(TR / (IRwss(mg/day) x CSFsoil(risk/pCi) x 10^{-3}(g/mg) x EFwsubs(day/yr) x EDw(yr)) + (IRaw(m^3/hr) x 1/PEF(m^3/kg) x CSFi(risk/pCi) x 1000(g/kg) x EFwsubs(day/yr) x EDw(yr) x ETo_w(hr/day) x (ETFo_w + ETFi_w))) + (CSFe(risk/yr/pCi/g) x EF_wsubs(day/yr)/365(day/yr) x ETo_w(hr/day)/24 x ED_w(yr) x ACF) x ETFo_w x GSF

1.2.3 Subsurface Soil Screening-Level Preliminary Remediation Goal Values

Table A-4 presents the subsurface soil screening-level PRG values.

Table A-4
WRW Subsurface Soil Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Subsurface Soil PRG HQ = 0.1	WRW Carcinogenic Subsurface Soil PRG Risk = 1E-06	WRW Subsurface Soil PRG Risk = 1E-06 or HQ = 0.1	Units
1,1,1,2-Tetrachloroethane	79-34-5	38325000	1046707	1046707	ug/kg
1,1,1-Trichloroethane	79-00-5	105554221		105554221	ug/kg
1,1,2,2-Tetrachloroethane	127-18-4	76650000	120551	120551	ug/kg
1,1,2-Trichloro-1,2,2-trifluoroethane	118-96-7	27409193194		27409193194	ug/kg
1,1,2-Trichloroethane	79-01-6	5110000	322253	322253	ug/kg
1,1-Dichloroethane	107-06-2	31231437		31231437	ug/kg
1,1-Dichloroethene [a]	540-59-0	199706		199706	ug/kg
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	19408-74-3		5.55	5.55	ug/kg
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	67-72-1		5.55	5.55	ug/kg
1,2,3-Trichloropropane	76-13-1	1827027	23910	23910	ug/kg
1,2,4,5-Tetrachlorobenzene	630-20-6	276495		276495	ug/kg
1,2,4-Trichlorobenzene	71-55-6	1740638		1740638	ug/kg
1,2,4-Trimethylbenzene	95-63-6	1525000		1525000	ug/kg
1,2-Dibromo-3-chloropropane	84-74-2	206202	34137	34137	ug/kg
1,2-Dichlorobenzene (o-)	541-73-1	33249041		33249041	ug/kg
1,2-Dichloroethane	75-35-4	711529	152603	152603	ug/kg
1,2-Dichloroethene (cis-)	156-59-2	12775000		12775000	ug/kg
1,2-Dichloroethene (total)	120-83-2	11497500		11497500	ug/kg
1,2-Dichloroethene (trans-)	156-60-5	3304000		3304000	ug/kg

128

Table A-4
WRW Subsurface Soil Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Subsurface Soil PRG HQ = 0.1	WRW Carcinogenic Subsurface Soil PRG Risk = 1E-06	WRW Subsurface Soil PRG Risk = 1E-06 or HQ = 0.1	Units
1,2-Dichloropropane	542-75-6	441907	703248	441907	ug/kg
1,2-Diphenylhydrazine	85-00-7		43021	43021	ug/kg
1,3,5-Trimethylbenzene	108-67-8	1315000		1315000	ug/kg
1,3-Dichlorobenzene	106-46-7	38325000		38325000	ug/kg
1,3-Dichloropropene	10061-01-5	876004	223462	223462	ug/kg
1,4-Dichlorobenzene (p-)	91-94-1	33961116	1050120	1050120	ug/kg
1,4-Dioxane	1746-01-6		4347351	4347351	ug/kg
2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	75-09-2	921651		921651	ug/kg
2,3,4,6-Tetrachlorophenol	7440-28-0	27649520		27649520	ug/kg
2,4,5-T	93-76-5	9217000		9217000	ug/kg
2,4,5-Trichlorophenol	88-06-2	92165067		92165067	ug/kg
2,4,6-Trichlorophenol	93-72-1		3128634	3128634	ug/kg
2,4,6-Trinitrotoluene	7440-61-1	460825	1150010	460825	ug/kg
2,4-Dichlorophenol	94-75-7	2764952		2764952	ug/kg
2,4-Dimethylphenol	131-11-3	18433013		18433013	ug/kg
2,4-Dinitrophenol	121-14-2	1843301		1843301	ug/kg
2,4-Dinitrotoluene	606-20-2	1843301		1843301	ug/kg
2,6-Dinitrotoluene	117-84-0	921651		921651	ug/kg
2-Butanone (methyl ethyl ketone)	78-93-3	533293318		533293318	ug/kg
2-Chloronaphthalene	95-57-8	73732054		73732054	ug/kg
2-Chlorophenol	2921-88-2	6387500		6387500	ug/kg
2-Chlorotoluene	95-49-8	25550000		25550000	ug/kg
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	93-65-2	460825		460825	ug/kg
2-Methylnaphthalene	108-10-1	3686603		3686603	ug/kg
2-Methylphenol (o-cresol)	106-44-5	46082534		46082534	ug/kg
2-Nitroaniline	100-01-6	2209570		2209570	ug/kg
3,3-Dichlorobenzidine	75-71-8		76667	76667	ug/kg
4-(2,4-Dichlorophenoxy) butyric acid (2,4-DB)	78-87-5	7373205		7373205	ug/kg
4,4-DDD	72-55-9		178570	178570	ug/kg
4,4-DDE	50-29-3		126049	126049	ug/kg
4,4-DDT	75-99-0	572444	125658	125658	ug/kg
4,6-Dinitro-2-methylphenol (4,6-dinitro-o-cresol)	51-28-5	92165		92165	ug/kg
4-Chloro-3-methylphenol	91-58-7				ug/kg

Table A-4
WRW Subsurface Soil Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Subsurface Soil PRG HQ = 0.1	WRW Carcinogenic Subsurface Soil PRG Risk = 1E-06	WRW Subsurface Soil PRG Risk = 1E-06 or HQ = 0.1	Units
4-Chloroaniline	108-90-7	3686603		3686603	ug/kg
4-Methyl-2-pentanone (methyl isobutyl ketone)	95-48-7	956917564		956917564	ug/kg
4-Methylphenol (p-cresol)	1634-04-4	4608253		4608253	ug/kg
4-Nitroanaline	98-95-3	3792857	2391043	2391043	ug/kg
4-Nitrophenol	924-16-3	7373205		7373205	ug/kg
Acenaphthene	83-32-9	51034336		51034336	ug/kg
Acenaphthylene	208-96-8				ug/kg
Acetone	67-64-1	1149750000		1149750000	ug/kg
Acrolein	107-02-8	4919		4919	ug/kg
Acrylonitrile	107-13-1	350508	53153	53153	ug/kg
Alachlor	15972-60-8	9216507	431254	431254	ug/kg
Aldicarb	116-06-3	921651		921651	ug/kg
Aldicarb sulfone	1646-88-4	921651		921651	ug/kg
Aldicarb sulfoxide	1646-87-3				ug/kg
Aldrin	309-00-2	27650	2024	2024	ug/kg
Aluminum	7429-90-5	284902		284902	mg/kg
Ammonium (as ammonia)	7664-41-7	10476464		10476464	mg/kg
Anthracene	120-12-7	255171679		255171679	ug/kg
Antimony	7440-36-0	511		511	mg/kg
Aroclor 1016	12674-11-2	58048	15514	15514	ug/kg
Aroclor 1221	11104-28-2		15514	15514	ug/kg
Aroclor 1232	11141-16-5		15514	15514	ug/kg
Aroclor 1242	53469-21-9		15514	15514	ug/kg
Aroclor 1248	12672-29-6		15514	15514	ug/kg
Aroclor 1254	11097-69-1	16585	15514	15514	ug/kg
Aroclor 1260	11096-82-5		15514	15514	ug/kg
Arsenic	7440-38-2	343	27.7	27.7	mg/kg
Atrazine	1912-24-9	32257774	156820	156820	ug/kg
Barium	7440-39-3	33033		33033	mg/kg
Benzene	71-43-2	1660974	270977	270977	ug/kg
Benzidine	92-87-5	2764952	150	150	ug/kg
Benzo(a)anthracene	56-55-3		43616	43616	ug/kg
Benzo(a)pyrene	50-32-8		4357	4357	ug/kg
Benzo(b)fluoranthene	205-99-2		43616	43616	ug/kg

130

Table A-4
WRW Subsurface Soil Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Subsurface Soil PRG HQ = 0.1	WRW Carcinogenic Subsurface Soil PRG Risk = 1E-06	WRW Subsurface Soil PRG Risk = 1E-06 or HQ = 0.1	Units
Benzo(g,h,i)perylene	191-24-2				ug/kg
Benzo(k)fluoranthene	207-08-9		436159	436159	ug/kg
Benzoic Acid (at pH 7)	65-85-0	3686602698		3686602698	ug/kg
Benzyl Alcohol	100-51-6	276495202		276495202	ug/kg
Beryllium	7440-41-7	1151	1634	1151	mg/kg
bis(2-chloroethyl)ether	111-44-4		43315	43315	ug/kg
bis(2-chloroisopropyl)ether	108-60-1	51100000	681967	681967	ug/kg
bis(2-ethylhexyl)phthalate	117-81-7	18433013	2458128	2458128	ug/kg
Boron	7440-42-8	108980		108980	mg/kg
Bromodichloromethane	75-27-4	25550000	771304	771304	ug/kg
Bromoform	75-25-2	25550000	4828368	4828368	ug/kg
Bromomethane (methyl bromide)	74-83-9	241033		241033	ug/kg
Butylbenzylphthalate	85-68-7	184330135		184330135	ug/kg
Cadmium (food)	7440-43-9	1051	2179	1051	mg/kg
Carbazole	1563-66-2		1725015	1725015	ug/kg
Carbofuran	75-15-0	4608253		4608253	ug/kg
Carbon disulfide	56-23-5	18825864		18825864	ug/kg
Carbon tetrachloride	5103-71-9	97124	99321	97124	ug/kg
Chlordane-alpha	5103-74-2	549155	117997	117997	ug/kg
Chlordane-beta	12789-03-6	549155	117997	117997	ug/kg
Chlordane-gamma	106-47-8	549155	117997	117997	ug/kg
Chlorobenzene	75-00-3	7665015		7665015	ug/kg
Chloroethane (ethyl chloride)	67-66-3	81562747	16489950	16489950	ug/kg
Chloroform	74-87-3	2241014	90270	90270	ug/kg
Chloromethane (methyl chloride)	59-50-7	1323388		1323388	ug/kg
Chlorpyrifos	16065-83-1	2764952		2764952	ug/kg
Chromium III	18540-29-9	1916250		1916250	mg/kg
Chromium VI	218-01-9	2806	327	327	mg/kg
Chrysene	7440-48-4		4361590	4361590	ug/kg
cis-1,3-Dichloropropene	10061-02-6	876004	223462	223462	ug/kg
Cobalt	7440-50-8	1932	1401	1401	mg/kg
Copper	57-12-5	51100		51100	mg/kg
Cyanide	110-82-7	25550		25550	mg/kg
Cyclohexane	72-54-8	628587824423		628587824423	ug/kg

131

Table A-4
WRW Subsurface Soil Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Subsurface Soil PRG HQ = 0.1	WRW Carcinogenic Subsurface Soil PRG Risk = 1E-06	WRW Subsurface Soil PRG Risk = 1E-06 or HQ = 0.1	Units
Dalapon	8065-48-3	27649520		27649520	ug/kg
Demeton	53-70-3	36866		36866	ug/kg
Di(2-ethylhexyl)adipate	84-66-2	552990405	28750244	28750244	ug/kg
Dibenzo(a,h)anthracene	132-64-9		4362	4362	ug/kg
Dibenzofuran	124-48-1	2555000		2555000	ug/kg
Dibromochloromethane	96-12-8	25550000	569296	569296	ug/kg
Dicamba	95-50-1	27649520		27649520	ug/kg
Dichlorodifluoromethane	75-34-3	2642930		2642930	ug/kg
Dichlorophenoxyacetic acid (2,4-D)	94-82-6	9216507		9216507	ug/kg
Dieldrin	60-29-7	46083	2151	2151	ug/kg
Diethyl ether	103-23-1	255500000		255500000	ug/kg
Diethylphthalate	60-51-5	737320540		737320540	ug/kg
Dimethoate	105-67-9	184330		184330	ug/kg
Dimethylphthalate	534-52-1	9216506746		9216506746	ug/kg
Di-n-butylphthalate	1918-00-9	92165067		92165067	ug/kg
Di-n-octylphthalate	88-85-7	36866027		36866027	ug/kg
Dinoseb	123-91-1	921651		921651	ug/kg
Dioxin (TCDD)	122-66-7		0.28	0.28	ug/kg
Diquat	959-98-8	2027631		2027631	ug/kg
Endosulfan (technical)	72-20-8	5529904		5529904	ug/kg
Endosulfan I	33213-65-9	5529904		5529904	ug/kg
Endosulfan II	1031-07-8	5529904		5529904	ug/kg
Endosulfan sulfate	115-29-7	5529904		5529904	ug/kg
Endrin (technical)	7421-93-4	276495		276495	ug/kg
Endrin aldehyde	53494-70-5	276495		276495	ug/kg
Endrin ketone	141-78-6	383250		383250	ug/kg
Ethyl acetate	100-41-4	1149750000		1149750000	ug/kg
Ethylbenzene	106-93-4	61938689		61938689	ug/kg
Ethylene dibromide (1,2-Dibromoethane)	206-44-0	74400	403	403	ug/kg
Fluoranthene	86-73-7	34022891		34022891	ug/kg
Fluorene	7782-41-4	36866027		36866027	ug/kg
Fluoride (as fluorine)	1071-83-6	76650		76650	mg/kg
Glyphosate	86-50-0	92165067		92165067	ug/kg
Guthion	76-44-8				ug/kg

132

Table A-4
WRW Subsurface Soil Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Subsurface Soil PRG HQ = 0.1	WRW Carcinogenic Subsurface Soil PRG Risk = 1E-06	WRW Subsurface Soil PRG Risk = 1E-06 or HQ = 0.1	Units
Heptachlor	1024-57-3	460825	7647	7647	ug/kg
Heptachlor epoxide	118-74-1	11981	3782	3782	ug/kg
Hexachlorobenzene	87-68-3	737321	21508	21508	ug/kg
Hexachlorobutadiene	319-84-6	255500	522423	255500	ug/kg
Hexachlorocyclohexane, alpha (alpha-BHC)	319-85-7		6555	6555	ug/kg
Hexachlorocyclohexane, beta (beta-BHC)	319-86-8		22942	22942	ug/kg
Hexachlorocyclohexane, delta (delta-BHC)	58-89-9				ug/kg
Hexachlorocyclohexane, gamma (gamma-BHC)	608-73-1	331979	31864	31864	ug/kg
Hexachlorocyclohexane, Technical (Lindane)	77-47-4		22944	22944	ug/kg
Hexachlorocyclopentadiene	34465-46-8	4375200		4375200	ug/kg
Hexachlorodibenzo-p-dioxin	57653-85-7		5.55	5.55	ug/kg
Hexachloroethane	193-39-5	1277500	2958255	1277500	ug/kg
Indeno(1,2,3-cd)pyrene	7439-89-6		43616	43616	ug/kg
Iron	78-83-1	383250		383250	mg/kg
Isobutyl alchohol	78-59-1	383250000		383250000	ug/kg
Isophorone	98-82-8	184330135	36316098	36316098	ug/kg
Isopropylbenzene (cumene)	7439-92-1	127750000	375823	375823	ug/kg
Lead	7439-93-2	1000		1000	mg/kg
Lithium	7439-96-5	25550		25550	mg/kg
Manganese (food)	7439-97-6	5089		5089	mg/kg
Mercury	72-43-5	379		379	mg/kg
Methoxychlor	94-74-6	4608253		4608253	ug/kg
Methyl methacrylate	91-57-6	142868503		142868503	ug/kg
Methyl tert-butyl ether	2385-85-5	438966133	8625073	8625073	ug/kg
Methylene chloride (dichloromethane)	80-62-6	57549241	3125604	3125604	ug/kg
Mirex	7439-98-7	184		184	mg/kg
Molybdenum	91-20-3	6387500		6387500	ug/kg
m-p-Xylene	108-38-3	12179060		12179060	ug/kg
m-Xylene	95-47-6	12179060		12179060	ug/kg
Naphthalene	7440-02-0	16137963		16137963	ug/kg
Nickel (soluble)	14797-55-8	25550		25550	mg/kg
Nitrate	14797-65-0	2044000		2044000	mg/kg
Nitrite	88-74-4	127750		127750	mg/kg

133

Table A-4
WRW Subsurface Soil Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Subsurface Soil PRG HQ = 0.1	WRW Carcinogenic Subsurface Soil PRG Risk = 1E-06	WRW Subsurface Soil PRG Risk = 1E-06 or HQ = 0.1	Units
Nitrobenzene	100-02-7	497333		497333	ug/kg
N-Nitrosodiethylamine	62-75-9		229	229	ug/kg
N-Nitrosodimethylamine	86-30-6	7373	675	675	ug/kg
N-Nitroso-di-n-butylamine	55-18-5		5977	5977	ug/kg
N-Nitrosodi-N-propylamine	930-55-2		4929	4929	ug/kg
N-Nitrosodiphenylamine	621-64-7	18433013	7040876	7040876	ug/kg
N-Nitrosopyrrolidine	99-99-0		16387	16387	ug/kg
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	23135-22-0	46082534		46082534	ug/kg
Oxamyl (vydate)	56-38-2	23041267		23041267	ug/kg
o-Xylene	7440-66-6	12179060		12179060	ug/kg
Parathion	608-93-5	5529904		5529904	ug/kg
Pentachlorobenzene	87-86-5	737321		737321	ug/kg
Pentachlorophenol	85-01-8	19501336	202777	202777	ug/kg
Phenanthrene	108-95-2				ug/kg
Phenol	1918-02-1	276495202		276495202	ug/kg
Picloram	129-00-0	64515547		64515547	ug/kg
p-Nitrotoluene	2691-41-0	12775000	2812992	2812992	ug/kg
p-Xylene	136777-61-2	12179060		12179060	ug/kg
Pyrene	7782-49-2	25517168		25517168	ug/kg
Selenium	7440-22-4	6388		6388	mg/kg
Silver	122-34-9	6388		6388	mg/kg
Simazine	7440-24-6	4608253	287502	287502	ug/kg
Strontium	100-42-5	766500		766500	mg/kg
Styrene	18496-25-8	158576458		158576458	ug/kg
Sulfide	95-94-3				mg/kg
Tetrachloroethene	58-90-2	9931877	77111	77111	ug/kg
Tetraethyl dithiopyrophosphate	3689-24-5	460830		460830	ug/kg
Thallium	7440-31-5	89.4		89.4	mg/kg
Tin	7440-32-6	766500		766500	mg/kg
Titanium	108-88-3	1950035		1950035	mg/kg
Toluene	8001-35-2	35583491		35583491	ug/kg
Toxaphene	120-82-1		31284	31284	ug/kg
trans-1,3-Dichloropropene	60-57-1	998136	239434	239434	ug/kg
Trichloroethene [a]	79-01-6	334363	20354	20354	ug/kg

134

Table A-4
WRW Subsurface Soil Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Subsurface Soil PRG HQ = 0.1	WRW Carcinogenic Subsurface Soil PRG Risk = 1E-06	WRW Subsurface Soil PRG Risk = 1E-06 or HQ = 0.1	Units
Trichlorofluoromethane	95-95-4	17376716		17376716	ug/kg
Trichlorophenoxyproprionic acid	96-18-4	1947743		1947743	ug/kg
Uranium (soluble salts)	7440-62-2	3833		3833	mg/kg
Vanadium	108-05-4	1278		1278	mg/kg
Vinyl acetate	75-01-4	30440762		30440762	ug/kg
Vinyl chloride	1330-20-7	1583104	24948	24948	ug/kg
Xylene (total)	106-42-3	12179060		12179060	ug/kg
Zinc	14596-10-2	383250		383250	mg/kg
Americium-241	14596-10-2		88	88	pCi/g
Cesium-134	013967-70-9		0.91	0.91	pCi/g
Cesium-137+D	10045-97-3		2.54	2.54	pCi/g
Curium-245/246	015621-76-8		20.69	20.69	pCi/g
Neptunium-237	013994-20-2		62.5	62.5	pCi/g
Plutonium-236	015411-92-4		105	105	pCi/g
Plutonium-238	013981-16-3		68.7	68.7	pCi/g
Plutonium-239	15117-48-3		112	112	pCi/g
Plutonium -240	14119-33-6		113	113	pCi/g
Plutonium-241	014119-32-5		5980.92	5980.92	pCi/g
Plutonium-242	13982-10-0		71.82	71.82	pCi/g
Radium-226	13982-63-3		31.0	31.0	pCi/g
Radium-228+D	15262-20-1		1.28	1.28	pCi/g
Strontium-89	14158-27-1		416	416	pCi/g
Strontium -90+D	10098-97-2		152	152	pCi/g
Tritium	10028-17-8		288449	288449	pCi/g
Uranium-232	14158-29-3		41.49	41.49	pCi/g
Uranium-233	13968-55-3		131	131	pCi/g
Uranium-234	13966-29-5		291	291	pCi/g
Uranium-235	15117-96-1		12.1	12.1	pCi/g
Uranium-238	7440-61-1		337	337	pCi/g

a. Values recommended by CDPHE.

1.3 Surface Water Screening-Level Preliminary Remediation Goals

The WRW surface water exposure scenario consists of the following pathway: ingestion of surface water on the Site for 18.7 years while performing outdoor tasks near surface water. The scenario assumes the WRW may incidentally ingest surface water while performing biological surveying tasks 42 days per year (EBASCO 1993). This scenario was not

135

considered to be a significant exposure pathway in the Task 3 Report and Appendices: Calculation of Surface Radionuclide Soil Action Levels for Plutonium, Americium, and Uranium (EPA et al. 2002). Calculations in this appendix were performed deterministically. PRGs were calculated for both a 1×10^{-6} risk and an HQ of 0.1.

1.3.1 Surface Water Preliminary Remediation Goal Parameters

The PRG parameters presented in Table A-5 were used to derive PRGs using the equations listed in Section 1.2.2.

Table A-5
PRG Parameters for Surface Water Screen

Exposure Parameter	Variable	Unit	Point Estimate	Source
Target hazard index	THI	--	0.1	EPA 1991a
Target excess lifetime cancer risk	TR	--	1E-06	EPA 1991a
Adult body weight	BWa	kg	70	EPA 1991b
Averaging time - noncarcinogenic	ATnc	yr	18.7	EPA et al. 2002
Averaging time - carcinogenic	ATc	yr	70	EPA 1991b
Exposure frequency - surface water[a]	EFwsw	day/yr	42	EBASCO 1993
Exposure duration	EDw	yr	18.7	EPA et al. 2002
Surface water incidental ingestion rate	IRsw	L/day	0.03	EPA 1998
Oral reference dose	RfDo	mg/kg-day	chemical-specific	
Oral cancer slope factor	CSFo	risk/(mg/kg-day)	chemical-specific	
Water ingestion slope factor - radionuclides	CSFSw	risk/pCi	radionuclide-specific	

a - Value estimated from Table B.2 Att. 3-1(RMA IEA/RC Appendix B, 8/25/93).

1.3.2 Surface Water Preliminary Remediation Goal Equations

The following equations are used to derive the PRG values:

Noncarcinogenic Preliminary Remediation Goal =

((THI x ATnc(yr) x 365(day/yr))/(IRsw(L/hr) x ETwsw(hr/day) x EFwsw(day/yr) x EDw(yr) x 1/RfDo(mg/kg-day) x 1/BWa(kg)))

Carcinogenic Preliminary Remediation Goal =

((TR x ATc(yr) x 365(day/yr))/(IRsw(L/hr) x ETwsw(hr/day) x EFwsw(day/yr) x EDw(yr) x CSFo(risk/mg/kg-day) x (1/BWa(kg)))

Radionuclide Carcinogenic Preliminary Remediation Goal =

(TR/(IRsw(L/day) x EFwsw(day/yr) x EDw(yr) x CSFw (risk/pCi))

1.3.3 Surface Water Screening-Level Preliminary Remediation Goal Values

Table A-6 presents the surface water screening-level PRG values.

Table A-6
WRW Surface Water Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Surface Water PRG HQ = 0.1	WRW Carcinogenic Surface Water PRG Risk = 1E-06	WRW Surface Water PRG Risk = 1E-06 or HQ = 0.1	Units
Acenaphthene	83-32-9	121667		121667	ug/L

136

Table A-6
WRW Surface Water Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Surface Water PRG HQ = 0.1	WRW Carcinogenic Surface Water PRG Risk = 1E-06	WRW Surface Water PRG Risk = 1E-06 or HQ = 0.1	Units
Acenaphthylene	208-96-8				ug/L
Acetone	67-64-1	1825000		1825000	ug/L
Acrolein	107-02-8	1014		1014	ug/L
Acrylonitrile	107-13-1	2028	141	141	ug/L
Alachlor	15972-60-8	20278	949	949	ug/L
Aldicarb	116-06-3	2028		2028	ug/L
Aldicarb sulfone	1646-88-4	2028		2028	ug/L
Aldicarb sulfoxide	1646-87-3				ug/L
Aldrin	309-00-2	60.8	4.47	4.47	ug/L
Aluminum	7429-90-5	2028		2028	mg/L
Ammonium (as ammonia)	7664-41-7				mg/L
Anthracene	120-12-7	608333		608333	ug/L
Antimony	7440-36-0	0.81		0.81	mg/L
Aroclor 1016	12674-11-2	142	38	38	ug/L
Aroclor 1221	11104-28-2		38	38	ug/L
Aroclor 1232	11141-16-5		38	38	ug/L
Aroclor 1242	53469-21-9		38	38	ug/L
Aroclor 1248	12672-29-6		38	38	ug/L
Aroclor 1254	11097-69-1	40.6	38	38	ug/L
Aroclor 1260	11096-82-5		38	38	ug/L
Arsenic	7440-38-2	0.61	0.05	0.05	mg/L
Atrazine	1912-24-9	70972	345	345	ug/L
Barium	7440-39-3	142		142	mg/L
Benzene	71-43-2	8111	1380	1380	ug/L
Benzidine	92-87-5	6083	0.33	0.33	ug/L
Benzo(a)anthracene	56-55-3		104	104	ug/L
Benzo(a)pyrene	50-32-8		10.4	10.4	ug/L
Benzo(b)fluoranthene	205-99-2		104	104	ug/L
Benzo(g,h,i)perylene	191-24-2				ug/L
Benzo(k)fluoranthene	207-08-9		1040	1040	ug/L
Benzoic Acid (at pH 7)	65-85-0	8111111		8111111	ug/L
Benzyl Alcohol	100-51-6	608333		608333	ug/L
Beryllium	7440-41-7	4.06		4.06	mg/L
bis(2-chloroethyl)ether	111-44-4		69.0	69.0	ug/L
bis(2-chloroisopropyl)ether	108-60-1	81111	1084	1084	ug/L
bis(2-ethylhexyl)phthalate	117-81-7	40556	5422	5422	ug/L
Boron	7440-42-8	183		183	mg/L
Bromodichloromethane	75-27-4	40556	1224	1224	ug/L

137

Table A-6
WRW Surface Water Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Surface Water PRG HQ = 0.1	WRW Carcinogenic Surface Water PRG Risk = 1E-06	WRW Surface Water PRG Risk = 1E-06 or HQ = 0.1	Units
Bromoform	75-25-2	40556	9608	9608	ug/L
Bromomethane (methyl bromide)	74-83-9	2839		2839	ug/L
2-Butanone (methyl ethyl ketone)	78-93-3	1216667		1216667	ug/L
Butylbenzylphthalate	85-68-7	405556		405556	ug/L
Cadmium (water)	7440-43-9	1.01		1.01	mg/L
Carbazole	86-74-8		3795	3795	ug/L
Carbofuran	1563-66-2	10139		10139	ug/L
Carbon disulfide	75-15-0	202778		202778	ug/L
Carbon tetrachloride	56-23-5	1419	584	584	ug/L
Chlordane-alpha	5103-71-9	1014	217	217	ug/L
Chlordane-beta	5103-74-2	1014	217	217	ug/L
Chlordane-gamma	12789-03-6	1014	217	217	ug/L
4-Chloroaniline	106-47-8	8111		8111	ug/L
Chlorobenzene	108-90-7	40556		40556	ug/L
Chloroethane (ethyl chloride)	75-00-3	811111	26175	26175	ug/L
Chloroform	67-66-3	20278		20278	ug/L
Chloromethane (methyl chloride)	74-87-3				ug/L
4-Chloro-3-methylphenol	59-50-7				ug/L
2-Chloronaphthalene	91-58-7	162222		162222	ug/L
2-Chlorophenol	95-57-8	10139		10139	ug/L
Chlorpyrifos	2921-88-2	6083		6083	ug/L
Chromium III	16065-83-1	3042		3042	mg/L
Chromium VI	18540-29-9	6.08		6.08	mg/L
Chrysene	218-01-9		10398	10398	ug/L
Cobalt	7440-48-4	40.6		40.6	mg/L
Copper	7440-50-8	81.1		81.1	mg/L
Cyanide	57-12-5	40.6		40.6	mg/L
Cyclohexane	110-82-7				ug/L
4,4-DDD	72-54-8		316	316	ug/L
4,4-DDE	72-55-9		223	223	ug/L
4,4-DDT	50-29-3		223	223	ug/L
Dalapon	75-99-0	60833		60833	ug/L
Demeton	8065-48-3	81.1		81.1	ug/L
Dibenzo(a,h)anthracene	53-70-3		10.4	10.4	ug/L
Dibenzofuran	132-64-9	4056		4056	ug/L
Dibromochloromethane	124-48-1	40556	904	904	ug/L
1,2-Dibromo-3-chloropropane	96-12-8		54.2	54.2	ug/L

138

Table A-6
WRW Surface Water Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Surface Water PRG HQ = 0.1	WRW Carcinogenic Surface Water PRG Risk = 1E-06	WRW Surface Water PRG Risk = 1E-06 or HQ = 0.1	Units
Di-n-butylphthalate	84-74-2	202778		202778	ug/L
Dicamba	1918-00-9	60833		60833	ug/L
1,2-Dichlorobenzene (o-)	95-50-1	182500		182500	ug/L
1,3-Dichlorobenzene	541-73-1	60833		60833	ug/L
1,4-Dichlorobenzene (p-)	106-46-7	60833	3163	3163	ug/L
3,3-Dichlorobenzidine	91-94-1		169	169	ug/L
Dichlorodifluoromethane	75-71-8	405556		405556	ug/L
1,1-Dichloroethane	75-34-3	202778		202778	ug/L
1,2-Dichloroethane	107-06-2	40556	834	834	ug/L
1,1-Dichloroethene [a]	75-35-4	101389		101389	ug/L
1,2-Dichloroethene (total)	540-59-0	18250		18250	ug/L
2,4-Dichlorophenol	120-83-2	6083		6083	ug/L
Dichlorophenoxyacetic acid (2,4-D)	94-75-7	20278		20278	ug/L
4-(2,4-Dichlorophenoxy) butyric acid (2,4-DB)	94-82-6	16222		16222	ug/L
1,2-Dichloropropane	78-87-5		1116	1116	ug/L
1,3-Dichloropropene	542-75-6	60833	759	759	ug/L
cis-1,3-Dichloropropene	10061-01-5	60833	759	759	ug/L
trans-1,3-Dichloropropene	10061-02-6	60833	759	759	ug/L
Dieldrin	60-57-1	101	4.7	4.7	ug/L
Diethyl ether	60-29-7	405556		405556	ug/L
Di(2-ethylhexyl)adipate	103-23-1	1216667	63255	63255	ug/L
Diethylphthalate	84-66-2	1622222		1622222	ug/L
Dimethoate	60-51-5	406		406	ug/L
2,4-Dimethylphenol	105-67-9	40556		40556	ug/L
Dimethylphthalate	131-11-3	20277778		20277778	ug/L
4,6-Dinitro-2-methylphenol (4,6-dinitro-o-cresol)	534-52-1	203		203	ug/L
2,4-Dinitrophenol	51-28-5	4056		4056	ug/L
2,4-Dinitrotoluene	121-14-2	4056		4056	ug/L
2,6-Dinitrotoluene	606-20-2	2028		2028	ug/L
Di-n-octylphthalate	117-84-0	81111		81111	ug/L
Dinoseb	88-85-7	2028		2028	ug/L
1,4-Dioxane	123-91-1		6901	6901	ug/L
Dioxin (TCDD)	1746-01-6		0.0005	0.0005	ug/L
1,2-Diphenylhydrazine	122-66-7		94.9	94.9	ug/L
Diquat	85-00-7	4461		4461	ug/L
Endosulfan I	959-98-8	12167		12167	ug/L
Endosulfan II	33213-65-9	12167		12167	ug/L

139

Table A-6
WRW Surface Water Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Surface Water PRG HQ = 0.1	WRW Carcinogenic Surface Water PRG Risk = 1E-06	WRW Surface Water PRG Risk = 1E-06 or HQ = 0.1	Units
Endosulfan sulfate	1031-07-8	12167		12167	ug/L
Endosulfan (technical)	115-29-7	12167		12167	ug/L
Endrin (technical)	72-20-8	608		608	ug/L
Endrin aldehyde	7421-93-4	608		608	ug/L
Endrin ketone	53494-70-5	608		608	ug/L
Ethyl acetate	141-78-6	1825000		1825000	ug/L
Ethylbenzene	100-41-4	202778		202778	ug/L
Ethylene dibromide (1,2-Dibromoethane)	106-93-4		0.89	0.89	ug/L
Fluoranthene	206-44-0	81111		81111	ug/L
Fluorene	86-73-7	81111		81111	ug/L
Fluoride (as fluorine)	7782-41-4	122		122	mg/L
Glyphosate	1071-83-6	202778		202778	ug/L
Guthion	86-50-0				ug/L
Heptachlor	76-44-8	1014	16.9	16.9	ug/L
Heptachlor epoxide	1024-57-3	26.4	8.34	8.34	ug/L
Hexachlorobenzene	118-74-1	1622	47.4	47.4	ug/L
Hexachlorobutadiene	87-68-3	406	973	406	ug/L
Hexachlorocyclohexane, alpha (alpha-BHC)	319-84-6		12.0	12.0	ug/L
Hexachlorocyclohexane, beta (beta-BHC)	319-85-7		42.2	42.2	ug/L
Hexachlorocyclohexane, delta (delta-BHC)	319-86-8				ug/L
Hexachlorocyclohexane, gamma (gamma-BHC)	58-89-9	608	58.4	58.4	ug/L
Hexachlorocyclohexane, Technical (Lindane)	608-73-1		42.2	42.2	ug/L
Hexachlorocyclopentadiene	77-47-4	12167		12167	ug/L
Hexachlorodibenzo-p-dioxin	34465-46-8		0.012	0.012	ug/L
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7		0.012	0.012	ug/L
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3		0.012	0.012	ug/L
Hexachloroethane	67-72-1	2028	5422	2028	ug/L
Indeno(1,2,3-cd)pyrene	193-39-5		104	104	ug/L
Iron	7439-89-6	608		608	mg/L
Isobutyl alchohol	78-83-1	608333		608333	ug/L
Isophorone	78-59-1	405556	79901	79901	ug/L
Isopropylbenzene (cumene)	98-82-8	202778		202778	ug/L
Lead	7439-92-1	1.0			mg/L
Lithium	7439-93-2	40.6		40.6	mg/L
Manganese (food)	7439-96-5	284		284	mg/L

140

Table A-6
WRW Surface Water Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Surface Water PRG HQ = 0.1	WRW Carcinogenic Surface Water PRG Risk = 1E-06	WRW Surface Water PRG Risk = 1E-06 or HQ = 0.1	Units
Mercury	7439-97-6	0.61		0.61	mg/L
Methoxychlor	72-43-5	10139		10139	ug/L
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	94-74-6	1014		1014	ug/L
2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	93-65-2	2028		2028	ug/L
Methylene chloride (dichloromethane)	75-09-2	121667	10121	10121	ug/L
Methyl methacrylate	80-62-6	2838889		2838889	ug/L
2-Methylnaphthalene	91-57-6	8111		8111	ug/L
4-Methyl-2-pentanone (methyl isobutyl ketone)	108-10-1				ug/L
2-Methylphenol (o-cresol)	95-48-7	101389		101389	ug/L
4-Methylphenol (p-cresol)	106-44-5	10139		10139	ug/L
Methyl tert-butyl ether	1634-04-4		18977	18977	ug/L
Mirex	2385-85-5	406		406	ug/L
Molybdenum	7439-98-7	10.1		10.1	mg/L
Naphthalene	91-20-3	40556		40556	ug/L
Nickel (soluble)	7440-02-0	40.6		40.6	mg/L
Nitrate	14797-55-8	3244		3244	mg/L
Nitrite	14797-65-0	203		203	mg/L
2-Nitroaniline	88-74-4	6083		6083	ug/L
4-Nitroanaline	100-01-6	6083	3795	3795	ug/L
Nitrobenzene	98-95-3	1014		1014	ug/L
4-Nitrophenol	100-02-7	16222		16222	ug/L
N-Nitroso-di-n-butylamine	924-16-3		14.1	14.1	ug/L
N-Nitrosodiethylamine	55-18-5		0.51	0.51	ug/L
N-Nitrosodimethylamine	62-75-9		1	1	ug/L
N-Nitrosodiphenylamine	86-30-6	40556	15491	15491	ug/L
N-Nitrosodi-N-propylamine	621-64-7		10.8	10.8	ug/L
N-Nitrosopyrrolidine	930-55-2		36.1	36.1	ug/L
p-Nitrotoluene	99-99-0		4465	4465	ug/L
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	101389		101389	ug/L
Oxamyl (vydate)	23135-22-0	50694		50694	ug/L
Parathion	56-38-2	12167		12167	ug/L
Pentachlorobenzene	608-93-5	1622		1622	ug/L
Pentachlorophenol	87-86-5	60833	633	633	ug/L
Phenanthrene	85-01-8				ug/L
Phenol	108-95-2	608333		608333	ug/L

141

Table A-6
WRW Surface Water Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Surface Water PRG HQ = 0.1	WRW Carcinogenic Surface Water PRG Risk = 1E-06	WRW Surface Water PRG Risk = 1E-06 or HQ = 0.1	Units
Picloram	1918-02-1	141944		141944	ug/L
Pyrene	129-00-0	60833		60833	ug/L
Selenium	7782-49-2	10.1		10.1	mg/L
Silver	7440-22-4	10.1		10.1	mg/L
Simazine	122-34-9	10139	633	633	ug/L
Strontium	7440-24-6	1217		1217	mg/L
Styrene	100-42-5	405556		405556	ug/L
Sulfide	18496-25-8				mg/L
1,2,4,5-Tetrachlorobenzene	95-94-3	608		608	ug/L
1,1,1,2-Tetrachloroethane	630-20-6	60833	2919	2919	ug/L
1,1,2,2-Tetrachloroethane	79-34-5	121667	380	380	ug/L
Tetrachloroethene	127-18-4	20278	141	141	ug/L
2,3,4,6-Tetrachlorophenol	58-90-2	60833		60833	ug/L
Thallium	7440-28-0	0.14		0.14	mg/L
Tin	7440-31-5	1217		1217	mg/L
Titanium	7440-32-6	8111		8111	mg/L
Toluene	108-88-3	405556		405556	ug/L
Toxaphene	8001-35-2		69.0	69.0	ug/L
1,2,4-Trichlorobenzene	120-82-1	20278		20278	ug/L
1,1,1-Trichloroethane	71-55-6	567778		567778	ug/L
1,1,2-Trichloroethane	79-00-5	8111	1332	1332	ug/L
Trichloroethene [a]	79-01-6	608	190	190	ug/L
Trichlorofluoromethane	75-69-4	608333		608333	ug/L
2,4,5-Trichlorophenol	95-95-4	202778		202778	ug/L
2,4,6-Trichlorophenol	88-06-2		6901	6901	ug/L
Trichlorophenoxyproprionic acid	93-72-1	16222		16222	ug/L
1,2,3-Trichloropropane	96-18-4	12167	38.0	38.0	ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	60833333		60833333	ug/L
2,4,6-Trinitrotoluene	118-96-7	1014	2530	1014	ug/L
Uranium (soluble salts)	7440-61-1	6.08		6.08	mg/L
Vanadium[e]	7440-62-2	2.03		2.03	mg/L
Vinyl acetate	108-05-4	2027778		2027778	ug/L
Vinyl chloride	75-01-4	6083	50.6	50.6	ug/L
Xylene (total)	1330-20-7	405556		405556	ug/L
p-Xylene	106-42-3	405556		405556	ug/L
m-p-Xylene	136777-61-2	405556		405556	ug/L
m-Xylene	108-38-3	405556		405556	ug/L

142

Table A-6
WRW Surface Water Screening-Level PRG Values

Analyte	CAS Number	WRW Noncarcinogenic Surface Water PRG HQ = 0.1	WRW Carcinogenic Surface Water PRG Risk = 1E-06	WRW Surface Water PRG Risk = 1E-06 or HQ = 0.1	Units
o-Xylene	95-47-6	405556		405556	ug/L
Zinc	7440-66-6	608		608	mg/L
Am-241	14596-10-2		408	408	pCi/L
Cs-137+D	10045-97-3		1396	1396	pCi/L
Np-237	013994-20-2		687	687	pCi/L
Pu-236	015411-92-4		568	568	pCi/L
Pu-238	013981-16-3		324	324	pCi/L
Pu-239	15117-48-3		314	314	pCi/L
Pu-240	14119-33-6		314	314	pCi/L
Ra-226	13982-63-3		110	110	pCi/L
Ra-228+D	15262-20-1		41	41	pCi/L
Sr-89	14158-27-1		3316	3316	pCi/L
Sr-90+D	10098-97-2		574	574	pCi/L
Tritium	10028-17-8		837105	837105	pCi/L
U-233	13968-55-3		591	591	pCi/L
U-234	13966-29-5		600	600	pCi/L
U-235	15117-96-1		610	610	pCi/L
U-238	7440-61-1		663	663	pCi/L

a – Values recommended by CDPHE.

1.4 Subsurface Soil Screening-Level Preliminary Remediation Goals for the Volatilization Pathway

The WRW subsurface soil exposure scenario associated with volatilization consists of the following pathway: indoor inhalation of volatile organics emanating from subsurface soil for a WRW working at the Site for an average of 18.7 years, spending 50 percent of his or her time on site indoors. The worker is envisioned spending all of his or her time on the most contaminated areas of the Site. PRGs were calculated for both a 1E-06 risk and an HQ of 0.1. The more conservative of the two values is chosen for the PRG.

1.4.1 Subsurface Soil Volitalization Preliminary Remediation Goal Parameters and Equations

Johnson and Ettinger (1991) introduced a screening-level model that incorporates both convective and diffusive mechanisms for estimating the transport of contaminant vapors emanating from either subsurface soils or groundwater into indoor spaces located directly above the source of contamination. The Johnson and Ettinger model is a one-dimensional analytical solution to convective and diffusive vapor transport into indoor spaces. The model provides an estimated attenuation coefficient that relates the vapor concentration in the indoor space to the vapor concentration at the source of contamination. Inputs to the model include chemical properties of the contaminant, saturated and unsaturated zone soil properties, and structural properties of the building (Table A-7).

143

The Environmental Protection Agency (EPA) spreadsheets for the Johnson and Ettinger model were used to calculate PRGs associated with volatilization using site-specific and default modeling parameters. Toxicity values were updated to reflect the most recent values used for the other PRG screening values. The spreadsheets may be downloaded from the EPA Superfund site on the Internet. The user's manual for the model (EPA 2000) provides a discussion of the modeling parameters.

Table A-7
Parameters for Subsurface Soil Volatilization Screening Model

Screening Model User-entered Parameter	Value	Source
Target hazard quotient for non-carcinogens	0.1	
Target risk for carcinogens	1E-06	
Averaging time for non-carcinogens	18.7 years	EPA et al. 2002
Averaging time for carcinogens	70 years	EPA 1991b
Exposure frequency	250 days/year	EPA et al. 2002
Exposure duration	18.7 years	EPA et al. 2002
Vadose zone soil dry bulk density	1.59 g/cm^3	Site Average
Vadose zone soil total porosity	0.35 unitless	Site Average
Vadose zone soil water-filled porosity	0.2399 cm^3/cm^3	Site Average
Vadose zone soil organic carbon fraction	0.007 unitless	Site Average
Depth below grade to bottom of enclosed space floor	200 cm	Johnson and Ettinger 1991
Depth below grade to top of contamination	400 cm	Johnson and Ettinger 1991
Vadose zone SCS soil type	Sandy-Clay-Loam	Johnson and Ettinger 1991
Average soil and ground water temperature	10 °C	Johnson and Ettinger 1991
Average vapor flow rate into building	calculated	Johnson and Ettinger 1991

1.4.2 Subsurface Soil Volatilization Screening-Level Preliminary Remediation Goal Values

Table A-8 presents values for the subsurface soil volatilization screening-level PRGs.

Table A-8
WRW Subsurface Soil Volatilization Screening-Level PRG Values

Analyte	CAS Number	Noncarcinogenic Subsurface Soil HQ = 0.1 (µg/kg)	Carcinogenic Subsurface Soil Risk = 1E-06 (µg/kg)	Subsurface Soil Risk = 1E-06 or HQ = 0.1 (µg/kg)
1,1,1,2-Tetrachloroethane	630-20-6	1.54E+04	7.41E+02	7.41E+02
1,1,1-Trichloroethane	71-55-6	3.19E+04		3.19E+04
1,1,2,2-Tetrachloroethane	79-34-5		4.92E+02	4.92E+02
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	1.20E+06		1.20E+06
1,1,2-Trichloroethane	79-00-5	2.33E+03	3.89E+02	3.89E+02
1,1-Dichloroethane	75-34-3	8.65E+03		8.65E+03
1,1-Dichloroethene [b]	75-35-4	2.62E+01		2.62E+01
1,2,3-Trichloropropane	96-18-4	1.26E+03	1.69E+01	1.69E+01

144

Table A-8
WRW Subsurface Soil Volatilization Screening-Level PRG Values

Analyte	CAS Number	Noncarcinogenic Subsurface Soil HQ = 0.1 (µg/kg)	Carcinogenic Subsurface Soil Risk = 1E-06 (µg/kg)	Subsurface Soil Risk = 1E-06 or HQ = 0.1 (µg/kg)
1,2,4-Trichlorobenzene	120-82-1	1.60E+04		1.60E+04
1,2,4-Trimethylbenzene	95-63-6	3.61E+06		3.61E+06
1,2-Dichlorobenzene (o-)	95-50-1	1.24E+05		1.24E+05
1,2-Dichloroethane	107-06-2	3.70E+02	1.07E+02	1.07E+02
1,2-Dichloroethene (cis-)	156-59-2	9.11E+05		9.11E+05
1,2-Dichloroethene (trans-)	156-60-5	9.98E+05		9.98E+05
1,2-Dichloropropane	78-87-5		1.85E+02	1.85E+02
1,3,5-Trimethylbenzene	108-67-8	3.78E+06		3.78E+06
1,4-Dichlorobenzene (p-)	106-46-7	NOC		
2-Butanone (methyl ethyl ketone)	78-93-3	3.69E+06		3.69E+06
2-Methylnaphthalene	91-57-6			
4,4-DDD	72-54-8		NOC	NOC
4,4-DDE	72-55-9		NOC	NOC
4,4-DDT	50-29-3		NOC	NOC
4-Methyl-2-pentanone (methyl isobutyl ketone)	108-10-1	1.38E+06		1.38E+06
Acetone	67-64-1	3.10E+05		3.10E+05
Aldrin	309-00-2		NOC	NOC
alpha-BHC	319-84-6		1.14E+04	1.14E+04
Benzene	71-43-2	8.13E+02	1.30E+02	1.30E+02
bis(2-chloroethyl)ether	111-44-4		6.09E+02	6.09E+02
Bromoform	75-25-2		1.97E+04	1.97E+04
Bromomethane (methyl bromide)	74-83-9	4.12E+01		4.12E+01
Carbon disulfide	75-15-0	2.72E+03		2.72E+03
Carbon tetrachloride	56-23-5	2.45E+01	3.05E+01	2.45E+01
Chlordane-alpha	5103-71-9	NOC	NOC	NOC
Chlordane-beta	5103-74-2	NOC	NOC	NOC
Chlordane-gamma	12789-03-6	NOC	NOC	NOC
Chlorobenzene	108-90-7	8.57E+03		8.57E+03
Chloroethane (ethyl chloride)	75-00-3	4.31E+04		4.31E+04
Chloroform	67-66-3	1.42E+03	4.71E+01	4.71E+01
Chloromethane	74-87-3	3.46E+05	1.44E+05	1.44E+05
Chloromethane (methyl chloride)	74-87-3	3.46E+02	1.44E+02	1.44E+02
cis-1,3-Dichloropropene	10061-01-5	1.71E+02	8.01E+01	8.01E+01
Dibromochloromethane	124-48-1	1.69E+04	3.77E+02	3.77E+02
Dibromomethane	74-95-3	3.10E+06		3.10E+06
Dichlorodifluoromethane	75-71-8	6.36E+02		6.36E+02
Dieldrin	60-57-1	NOC	NOC	NOC
Di-n-butylphthalate	84-74-2			
Ethyl acetate	141-78-6	1.18E+06		1.18E+06
Ethyl ether	60-29-7	1.23E+03		1.23E+03

145

Table A-8
WRW Subsurface Soil Volatilization Screening-Level PRG Values

Analyte	CAS Number	Noncarcinogenic Subsurface Soil HQ = 0.1 (µg/kg)	Carcinogenic Subsurface Soil Risk = 1E-06 (µg/kg)	Subsurface Soil Risk = 1E-06 or HQ = 0.1 (µg/kg)
Ethylbenzene	100-41-4	1.11E+05		1.11E+05
Fluorene	86-73-7	NOC		NOC
gamma-BHC (lindane)	58-89-9	3.98E+05 [a]	3.82E+04	3.82E+04
Heptachlor	76-44-8		2.68E+02	2.68E+02
Hexachlorobenzene	118-74-1	NOC	NOC	NOC
Hexachlorobutadiene	87-68-3	1.40E+04	3.40E+04	1.40E+04
Hexachlorocyclopentadiene	77-47-4	8.12E+03		8.12E+03
Hexachloroethane	67-72-1	1.80E+04	4.81E+04	1.80E+04
Isobutyl alcohol	78-83-1	5.25E+06		5.25E+06
Isopropylbenzene (cumene)	98-82-8	6.76E+02		6.76E+02
Mercury (elemental)	7439-97-6	9.47E+00		9.47E+00
Methyl methacrylate	80-62-6	1.32E+05		1.32E+05
Methyl tert-butyl ether	1634-04-4	2.30E+05		2.30E+05
Methylene chloride (dichloromethane)	75-09-2	7.58E+04	2.01E+03	2.01E+03
Naphthalene	91-20-3	3.67E+04		3.67E+04
Nitrobenzene	98-95-3	1.94+04		1.94E+04
Styrene	100-42-5	6.82E+05		6.82E+05
Tetrachloroethene	127-18-4		2.65E+02	2.65E+02
Toluene	108-88-3	2.50E+04		2.50E+04
trans-1,3-Dichloropropene	10061-02-6	1.71E+02	8.01E+01	8.01E+01
Trichloroethene [b]	79-01-6	1.26E+03		1.26E+03
Trichlorofluoromethane	75-69-4	6.07E+03		6.07E+03
Vinyl acetate	108-05-4	2.03E+04		2.03E+04
Vinyl chloride	75-01-4	2.39E+02	1.02E+01	1.02E+01
Xylene (total)	1330-20-7	1.68E+04 [c]		1.68E+04 [b]

NOC = Not of Concern; the contaminant is solid at the soil temperature and not of concern for this pathway.
a - The calculated risk-based soil concentration exceeded the soil saturation concentration; the value listed is the saturation concentration.
b. Values recommended by CDPHE.
c - The listed value is for p-xylene, which is the most conservative xylene value.

1.5 Groundwater Screening-Level Preliminary Remediation Goals for the Volatilization Pathway

The WRW groundwater exposure scenario associated with volatilization consists of the following pathway: indoor inhalation of volatile organics emanating from groundwater for a WRW working at the Site for an average of 18.7 years, spending 50 percent of his or her time indoors. The worker is envisioned spending all of his or her time on the most contaminated areas of the Site. PRGs were calculated for both a 1E-06 risk and an HQ of 0.1. The more conservative of the two values is chosen for the PRG.

146

1.5.1 Groundwater Preliminary Remediation Goal Parameters and Equations

As discussed in Section 1.4.1, Johnson and Ettinger (1991) introduced a screening-level model that incorporates both convective and diffusive mechanisms for estimating the transport of contaminant vapors emanating from either subsurface soil or groundwater into indoor spaces located directly above the source of contamination. The model is a one-dimensional analytical solution to convective and diffusive vapor transport into indoor spaces. It provides an estimated attenuation coefficient that relates the vapor concentration in the indoor space to the vapor concentration at the source of contamination. Inputs to the model include chemical properties of the contaminant, saturated and unsaturated zone soil properties, and structural properties of the building (Table A - 9).

The EPA spreadsheets for the Johnson and Ettinger model were used to calculate PRGs associated with groundwater volatilization using Site-specific and default modeling parameters. Toxicity values were updated to reflect the latest values for the other PRG screening values. The spreadsheets may be downloaded from the EPA Superfund site on the Internet. The user's manual for the model (EPA 2000) provides a discussion of the modeling parameters.

Table A-9
Parameters for the Groundwater Volatilization Screening Model

Screening Model User-entered Parameter	Value	Source
Target hazard quotient for non-carcinogens	0.1	EPA 1991a
Target risk for carcinogens	1E-06	EPA 1991a
Averaging time for non-carcinogens	18.7 years	EPA et al. 2002
Averaging time for carcinogens	70 years	EPA 1991b
Exposure frequency	250 days/year	EPA et al. 2002
Exposure duration	18.7 years	EPA et al. 2002
Vadose zone soil dry bulk density	1.59 g/cm^3	Site Average
Vadose zone soil total porosity	0.35 unitless	Site Average
Vadose zone soil water-filled porosity	0.2399 cm^3/cm^3	Site Average
Depth below grade to bottom of enclosed space floor	200 cm	Johnson and Ettinger 1991
Depth below grade to water table	400 cm	Johnson and Ettinger 1991
SCS soil type directly above water table	Sandy-Clay-Loam	Johnson and Ettinger 1991
Average soil and groundwater temperature	10 °C	Johnson and Ettinger 1991
Average vapor flow rate into building	calculated	Johnson and Ettinger 1991
Vadose zone soil vapor permeability	calculated from soil type	Johnson and Ettinger 1991

1.5.2 Groundwater Volatilization Screening-Level Preliminary Remediation Goal Values

Table A-10 presents the values for the groundwater volatilization screening-level PRGs.

147

Table A-10
WRW Groundwater Volatilization Screening-Level PRG Values

Target Analyte	CAS Number	Noncarcinogenic Groundwater HQ = 0.1 (µg/L)	Carcinogenic Groundwater Risk = 1E-06 (µg/L)	Groundwater Risk = 1E-06 or HQ = 0.1 (µg/L)
1,1,1,2-Tetrachloroethane	630-20-6	1.88E+04	9.07E+02	9.07E+02
1,1,1-Trichloroethane	71-55-6	8.80E+04		8.80E+04
1,1,2,2-Tetrachloroethane	79-34-5		6.19E+02	6.19E+02
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	NOC		NOC
1,1,2-Trichloroethane	79-00-5		8.24E+02	8.24E+02
1,1-Dichloroethane	75-34-3	3.31E+04		3.38E+04
1,1-Dichloroethene [b]	75-35-4	1.39E+02		1.39E+02
1,2,3-Trichloropropane	96-18-4	4.20E+03	5.62E+01	5.62E+01
1,2,4-Trichlorobenzene	120-82-1	1.32E+03		1.32E+03
1,2,4-Trimethylbenzene	95-63-6	5.49E+02		5.49E+02
1,2-Dichlorobenzene (o-)	95-50-1	3.14E+04		3.14E+04
1,2-Dichloroethane	107-06-2	1.45E+03	4.19E+02	4.19E+02
1,2-Dichloroethene (cis-)	156-59-2	2.96E+03		2.96E+03
1,2-Dichloroethene (trans-)	156-60-5	3.23E+03		3.23E+03
1,2-Dichloropropane	78-87-5	5.05E+02	2.44E+02	2.44E+02
1,3,5-Trimethylbenzene	108-67-8	5.51E+00		5.51E+02
1,4-Dichlorobenzene (p-)	106-46-7	NOC	NOC	NOC
2-Butanone (methyl ethyl ketone)	78-93-3	2.20E+07		2.20E+07
4,4-DDD	72-54-8		NOC	NOC
4,4-DDE	72-55-9		NOC	NOC
4,4-DDT	50-29-3		NOC	NOC
4-Methyl-2-pentanone	108-10-1	6.42E+06		6.42E+06
4-Methyl-2-pentanone (methyl isobutyl ketone)	108-10-1	6.42E+06		6.42E+06
Acetone	67-64-1	2.00E+06		2.00E+06
Aldrin	309-00-2		NOC	NOC
alpha-BHC	319-84-6		1.30E+03	1.30E+03
Benzene	71-43-2	2.13E+03	3.41E+02	3.41E+02
bis(2-chloroethyl)ether	111-44-4		2.34E+03	2.34E+03
Bromoform	75-25-2	5.23E+04	2.54E+04	2.54E+04
Bromomethane (methyl bromide)	74-83-9	2.71E+02		2.71E+02
Carbon disulfide	75-15-0	1.83E+04		1.83E+04
Carbon tetrachloride	56-23-5	6.23E+01	7.77E+01	6.23E+01
Chlordane-alpha	5103-71-9	NOC	NOC	
Chlordane-beta	5103-74-2	NOC	NOC	
Chlordane-gamma	12789-03-6	NOC	NOC	
Chlorobenzene	108-90-7	6.64E+03		6.64E+03
Chloroethane (ethyl chloride)	75-00-3	3.94E+05		3.94E+05
Chloroform	67-66-3	4.40E+03	1.46E+02	1.46E+02
Chloromethane	74-87-3	4.73E+03	1.97E+03	1.97E+03
Chloromethane (methyl chloride)	74-87-3	4.73E+03	1.97E+03	1.97E+03
cis-1,3-Dichloropropene	10061-01-5	7.98E+02	3.74E+02	3.74E+02

148

Table A-10
WRW Groundwater Volatilization Screening-Level PRG Values

Target Analyte	CAS Number	Noncarcinogenic Groundwater HQ = 0.1 (µg/L)	Carcinogenic Groundwater Risk = 1E-06 (µg/L)	Groundwater Risk = 1E-06 or HQ = 0.1 (µg/L)
Dibromochloromethane	124-48-1	2.88E+04	6.41E+02	6.41E+02
Dibromomethane	74-95-3	1.35E+04		1.35E+04
Dichlorodifluoromethane	75-71-8	1.76E+03		1.76E+03
Dieldrin	60-57-1	NOC	NOC	NOC
Ethyl acetate	141-78-6	6.02E+06		6.02E+06
Ethyl ether	60-29-7	2.04E+04		2.04E+04
Ethylbenzene	100-41-4	7.09E+04		7.09E+04
Fluorene	86-73-7	NOC		
gamma-BHC (lindane)	58-89-9	7.30E+03 [a]	4.99E+03	4.99E+03
Heptachlor	76-44-8	3.80E+01	6.25E-01	6.25E-01
Hexachlorobenzene	118-74-1	NOC	NOC	NOC
Hexachlorobutadiene	87-68-3	6.36E+01	1.55E+02	6.36E+01
Hexachlorocyclopentadiene	77-47-4	1.22E+01		1.22E+01
Hexachloroethane	67-72-1	1.41E+03	3.76E+03	1.41E+03
Isobutyl alcohol	78-83-1	3.10E+07		3.10E+07
Isopropylbenzene (cumene)	98-82-8	1.94E+03		1.94E+03
Mercury (elemental)	7439-97-6	2.90E+01		2.90E+01
Methyl methacrylate	80-62-6	6.67E+05		6.67E+05
Methyl tert-butyl ether	1634-04-4	1.19E+06		1.19E+06
Methylene chloride (dichloromethane)	75-09-2	3.79E+05	1.00E+04	1.00E+04
Naphthalene	91-20-3	2.63E+03		2.63E+03
Nitrobenzene	98-95-3	3.05E+04		3.05E+04
Styrene	100-42-5	1.50E+05		1.50E+05
Tetrachloroethene	127-18-4	2.14E+04		2.14E+04
Toluene	108-88-3	2.82E+04		2.82E+04
trans-1,3-Dichloropropene	10061-02-6	7.98E+02	3.74E+02	3.74E+02
Trichloroethene [b]	79-01-6	1.83E+03		1.83E+03
Trichlorofluoromethane	75-69-4	1.07E+04		1.07E+04
Vinyl acetate	108-05-4	1.11E+05		1.11E+05
Vinyl chloride	75-01-4	2.29E+03	9.75E+01	9.75E+01
Xylene (total)	1330-20-7	7.00E+03 [c]		7.00E+03 [2]

NOC = Not of Concern; the contaminant is solid at the soil temperature and not of concern for this pathway.
a. The calculated risk-based soil concentration exceeded the soil saturation concentration; the value listed is the saturation concentration.
b. Values recommended by CDPHE.
c. The listed value is for p-xylene, which is the most conservative xylene value.

149

REFERENCES

DOE, EPA, and CDPHE, 1996, Rocky Flats Cleanup Agreement, Joint Agreement Between the U.S. Department of Energy, U.S. Environmental Protection Agency, Colorado Department of Public Health and Environment, and the State of Colorado, July 19.

EBASCO, 1993, Proposed Final Integrated Endangerment Assessment/Risk Characterization, Ver. 3, 1993.

EPA, 1991a, Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part B, Development of Risk-Based Preliminary Remediation Goals. Interim. Office of Emergency and Remedial Response, Washington, D.C. Publication 9285.7-01B. December.

EPA, 1991b, Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.6-03. March 25.

EPA, 1997, Exposure Factors Handbook. Volume 1 – General Factors. EPA/600/P-95/002Fa Office of Research and Development, National Center for Environmental Assessment, Washington, D.C. August 1997.

EPA, 1998, Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Vol..1-3, Draft, Office of Solid Waste, EPA 530/D-98/001A-C.

EPA, 2000, User's Guide for the Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion into Buildings (Revised), December.

EPA, 2001, Risk Assessment Guidance for Superfund Vol. I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Interim Guidance. Office of Emergency and Remedial Response, Washington, D.C.

EPA, CDPHE, and DOE, 2002, Task 3 Report and Appendices: Calculation of Surface Radionuclide Soil Action Levels for Plutonium, Americium, and Uranium, Rocky Flats Environmental Technology Site, Golden, Colorado, September.

Johnson, P.C., and R.A. Ettinger, 1991, Heuristic Model for Predicting the Intrusion Rate of Contaminant Vapors in Buildings, Environ. Sci. Technol, 25:1445-1452, Modified by the USEPA in 1998, 2001, 2002, and 2003.

150

Appendix B

APPENDIX B
Calculation of Ecological Screening Levels, Methods, Sources and Results

151

TABLE OF CONTENTS

152

LIST OF FIGURES

LIST OF TABLES

ATTACHMENTS

153

ACRONYMS

ATSDR	Agency for Toxic Substance and Disease Registry
AWQC	Ambient Water Quality Criteria
BAF	bioaccumulation factor
BDAC	Biological Dose Assessment Committee
CAS	Chemical Abstract Service
CCME	Canadian Council of Ministers of the Environment
CCR	Colorado Code of Regulations
CDPHE	Colorado Department of Public Health and Environment
COPC	contaminant of potential concern
CRA	Comprehensive Risk Assessment
DAR	Data Adequacy Report
DOE	U.S. Department of Energy
EC20	twenty percent effects concentration
ECOI	ecological contaminant of interest
ECOPC	ecological contaminant of potential concern
Eco-SSL	ecological soil screening level
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EqP	equilibrium partitioning value
ERA	ecological risk assessment
ERL	effects range low
ESA	Endangered Species Act
ESL	ecological screening level
EU	exposure unit
HSDB	Hazardous Substance Databank
HQ	hazard quotient
IA	Industrial Area
IHSS	Individual Hazardous Substance Site
IRIS	Integrated Risk Information System
ISQG	interim sediment quality guidelines

154

ACRONYMS

LEL	lowest effects level
LOAEL	lowest-observed adverse effects levels
MIDEQ	Michigan Department of Environmental Quality
MOEE	Ontario Ministry of Environment and Energy
NEL	no effects level
NOAA	National Oceanic and Atmospheric Association
NOAEL	no-observed adverse effects level
ORNL	Oak Ridge National Laboratory
PCB	polychlorinated biphenyl
PMJM	Preble's meadow jumping mouse
PRG	preliminary remediation goal
RESRAD	residual radioactive materials computer code
RFCA	Rocky Flats Cleanup Agreement
RFETS or Site	Rocky Flats Environmental Technology Site
RFI/RI	RCRA Facility Investigation/Remedial Investigation
SCM	Site Conceptual Model
SQG	Sediment Quality Guideline
SSL	soil screening level
TEC	threshold effects concentrations
TEL	threshold effects level
tESL	threshold ecological screening level
TRV	toxicity reference values
USFWS	U.S. Fish and Wildlife Service

UNIT DESCRIPTIONS

95UCL	upper confidence limit of the mean at a 95 percent level
°C	degrees Celsius (or Centigrade)
cm	centimeter
cm^2	square centimeter
cm^3	cubic centimeter
cm^3/cm^3	cubic centimeter per cubic centimeter
day/yr	days per year
ft	foot
g/kg	grams per kilogram
g/mg	grams per milligram
hr	hour
hr/day	hours per day
kg	kilogram
kg/m^3	kilograms per cubic meter
kg/mg	kilograms per milligram
L/day	liters per day
L/hr	liters per hour
m	meter
m^3	cubic meter
$m^3/\mu g$	cubic meters per microgram
m^3/day	cubic meters per day
m^3/hr	cubic meters per hour
m^3/kg	cubic meters per kilogram
m^3-yr/kg-day	cubic meter-year per kilogram-day
mg/cm^2	milligrams per square centimeter
mg/cm^2-event	milligrams per square centimeter-event
mg/day	milligrams per day
mg/kg	milligrams per kilogram

156

UNIT DESCRIPTIONS

mg/kg-day	milligrams per kilogram-day
$(mg/kg\text{-}day)^{-1}$	one divided by (mg/kg-day)
mg/kg BW/day	milligrams per kilogram per body weight per day
$mg/kg\ BW/day^{-1}$	one divided by (mg/kg BW/day)
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
mg-yr/kg-day	milligram-year per kilogram per day
pCi	picocurie
pCi/g	picocuries per gram
pCi/L	picocuries per liter
%	percent
rad/day	rad per day
risk/pCi	risk per picocurie
risk/yr/pCi/g	risk per year per picocurie per gram
risk/(mg/kg-day)	risk per milligram per kilogram-day
yr	year
yr/pCi/g	years per picocurie per gram
yr-pCi/g	year-picocurie per gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter

157

1.0 INTRODUCTION

To support the Draft Comprehensive Risk Assessment (CRA), ecological screening levels (ESLs) are developed here for more than 160 ecological contaminants of interest (ECOIs) identified from three main sources: (1) Table 3 of the Rocky Flats Cleanup Agreement (RFCA) Attachment 5 (DOE et al. 1996 [as modified]), (2) contaminants detected at the Site and (3) a list of potentially bioaccumulative analytes from the U.S. Environmental Protection Agency's (EPA's) Toxics Release Inventory Program (EPA 2004).

EPA's ecological soil screening level (Eco-SSL) (EPA 2003a) process was used as general guidance for developing the soil ESLs for vertebrate receptors. General equations and procedures from the Eco-SSL guidance were used to calculate ESLs, and extensive use was made of existing databases and compilations of ecotoxicity information. The ESLs were developed consistent with the steps recommended in the guidance as follows:

1. Identify the Wildlife Risk Model: Develop a Site Conceptual Model (SCM) with receptors, exposure pathways, and exposure scenarios. Quantify an equation that relates the contaminant concentration in soil to an acceptable threshold based on an exposure model.

2. Select Surrogate Wildlife Species: Identify species that are representative of the functional groups for which risk is to be evaluated.

3. Estimate Exposure Dose: Determine exposure parameters and quantify dose for each selected contaminant.

4. Derive the toxicity reference values (TRVs): Identify an acceptable dose or exposure.

5. Calculate the ESL: Solve the exposure equation for ECOI concentrations in soil that result in exposure equal to the TRV.

Methods for identifying ESLS for terrestrial plants, terrestrial invertebrates, and aquatic receptors in sediment and surface water are also presented in the following sections.

2.0 METHODS FOR TASK 1: DEVELOPING A SITE CONCEPTUAL MODEL AND IDENTIFYING RECEPTOR TYPES AND EXPOSURE PARAMETERS

The Rocky Flats Environmental Technology Site (RFETS) environment, as it relates to the Ecological Risk Assessment (ERA) is described in detail in the Sitewide Conceptual Model Technical Memorandum prepared for the Draft Watershed ERA (DOE 1996a). This model has been updated for the CRA as the SCM and is shown on Figure 7.2 of Section 7 of the CRA Work Plan and Methodology.

2.1 Exposure Models and Receptors of Concern

ESLs were calculated based on general toxicological information about the ECOIs, exposure parameters for the selected receptor types, and information on bioaccumulation of specific

ECOIs from soil at Rocky Flats. Actual selection of the ESLs and the rationale for their selection is explained in Section 3.0. General methods for calculating ESLs for nonradionuclide and radionuclide ECOIs are presented in the following subsections.

2.1.1 General Exposure Model for Wildlife Soil Screening Levels

The general model for calculating ESLs for nonradionuclide ECOIs estimates the soil concentrations that result in wildlife intake rates (for example, ingestion rate) equal to benchmark values associated with approximate levels of toxicity (or lack thereof). Hereafter, the benchmark values will be referred to as TRVs. The relationship between the estimated environmental exposure and the TRV is usually expressed as a ratio called the "hazard quotient (HQ)" (EPA 1997a):

(Equation B-1)

$$HQ = \frac{\text{estimated exposure}}{TRV}$$

Therefore, the ESL is defined as the ECOI concentration in soil that results in an HQ = 1. For wildlife, exposure is estimated based on the following equation that describes the sum of ECOI intake from incidental ingestion of soil and ingestion of forage or prey:

(Equation B-2)

$$Exposure\ (Intake) = \left[(C_{soil} * P_{soil} * FIR * RBA_{soil}) + \left(\sum_{i=1}^{n} (C_{food} * P_{food} * FIR * RBA_{food}) \right) \right] * AUF$$

Where:

Exposure (Intake) = rate at which an ECOI is ingested from all sources (milligrams per kilogram [mg/kg] body weight[BW]/day)

C_{soil}	=	contaminant concentration for contaminant (j) in soil (mg/kg dry weight)
N	=	number of different biota food types in diet,
C_{food}	=	contaminant concentration in food type (i) (mg/kg dry weight)
P_{food}	=	proportion of biota type (i) in diet
FIR	=	food ingestion rate (kg food [dry weight]/ kg BW [wet weight] / day)
RBA_{food}	=	relative bioavailability of contaminant (j) from biota type (i) (RBA_{food} = 1)
RBA_{soil}	=	relative bioavailability of contaminant (j) from soil (RBA_{soil} = 1)
TRV	=	toxicity reference value (mg/kg BW/day)
P_{soil}	=	soil ingestion as proportion of diet
AUF	=	area use factor (AUF = 1)

159

Because the ESL is expressed as an ECOI concentration in soil, the concentration in food must also be expressed as a function of the concentration in soil. To accomplish this, bioaccumulation factors (BAFs) that predict the extent to which ECOIs accumulate in forage or prey are used. The BAF can be a simple ratio of ECOI concentration in biota: soil, or may be derived from regression equations if the relationship is nonlinear (EPA 2003a). The C_{food} term in the exposure equation can then be replaced:

(Equation B-3)

$$Exposure\,(Intake) = \left[(C_{soil} * P_{soil} * FIR * RBA_{soil}) + (\sum_{i=1}^{n}([BAF * C_{soil}] * P_{food} * FIR * RBA_{food})\right] * AUF$$

To estimate the ESL, the above equation is solved for the C_{soil} that results in an exposure equal to the TRV (that is, HQ = 1). ESLs will be applied for screening both surface and subsurface soil for burrowing receptors.

A much simpler approach was used for aquatic life and nonvertebrate terrestrial receptors. Most toxicological information on aquatic life is already expressed as a concentration in water or bulk sediment concentrations, which can then be used as direct estimates of the ESL.

TRVs used in the above equation were identified from available databases or the scientific literature and are presented in Section 3.1. Data available from RFETS were evaluated to determine whether applicable BAFs can be calculated for site-specific conditions, and used ESL calculations. If not, BAFs from the general scientific literature were identified and reviewed for potential use.

2.1.2 Approach for Radionuclides

Soil benchmarks for radionuclides were developed for RFETS during the Draft Watershed ERA (Higley and Kuperman 1995). Since then, DOE's Biological Dose Assessment Committee (BDAC) has developed additional procedures for assessing exposure and risk to terrestrial and aquatic biota using the RESRAD-BIOTA (DOE 2003b) computer code for calculating protectiveness..

For some radionuclides, Higley and Kuperman values were higher (less conservative) than those calculated with the RESRAD-BIOTA procedures. However, for terrestrial animals the radiation exposure limit cited in RESRAD-BIOTA as protective of ecological receptors (1 rad/day) is 10-fold that assumed in Higley and Kuperman (0.1 rad/day). Values developed for ecological receptors using either approach were significantly higher than values adopted for managing radionuclide risks to human receptors at the Site. In most cases, soil criteria were two to three orders of magnitude larger. Therefore, if the Site is managed to protect human health and EPCs are calculated using similar methods, then ecological receptors will be protected. This applies to special status species (for example, threatened or endangered) and nonthreatened or endangered receptor groups.

160

An exception to the above is exposure to subsurface soil and surface water. For human health assessment in the IA, the pathway to subsurface soil will not be evaluated because institutional controls prevent disturbance of soil; therefore, ESLs will be needed. For surface water, ecological benchmarks are lower than human health values for some radionuclides, primarily due to the higher use rate assumed in the calculations.

RESRAD-BIOTA was used to calculate all of the radionuclide ESLs that will be used in the CRA.

2.1.3 Identification of Representative Receptors

The purpose of the ESLs is to provide a mechanism for evaluating ecotoxicological risks from potentially contaminated abiotic media by comparing data on ECOI concentrations to benchmark values representing potential thresholds of adverse effects. Ecological receptors and their forage or prey utilize soil, sediment, and surface water with widely varying rates and intensities. Generally, species or functional groups that have the most extensive contact with soil or sediment, and/or the smallest home ranges, have the highest potential exposure. Assuming similar sensitivities to toxic effects of ECOIs, ESLs developed for such species are generally protective of groups with lower contact rates (EPA 2003a). Therefore, ESLs were developed for the potentially most-exposed functional groups present at RFETS:

- Fossorial (burrowing) small mammals (herbivores and omnivores);
- Small ground-feeding birds;
- Large mammalian herbivores;
- Mammalian predators;
- Terrestrial plants;
- Terrestrial Invertebrates;
- Aquatic community; and
- Avian predators.

The SCM for the Draft Watershed ERA (DOE 1996a) and more recent surveys identify several species of fossorial mammals as present at RFETS, including the deer mouse (*Peromyscus maniculatus*), meadow vole (*Microtus pennsylvanicus*), prairie vole (*M. ochrogaster*), plains harvest mouse (*Reithrodontomys montanus*), black-tailed prairie dog (*Cynomys ludavicianus*), and Preble's meadow jumping mouse (PMJM) (*Zapus hudsonius preblei*). Each of these species constructs and/or occupies borrows for significant parts of their life histories.

The black-tailed prairie dog and the PMJM are species of particular concern in Colorado. The prairie dog is the subject of voluntary habitat conservation initiatives in Colorado and adjoining states aimed at preventing the need for listing under the Endangered Species Act (ESA). The PMJM is a relatively rare subspecies found only along the Front Range of the Rocky Mountains. The species was listed as "threatened" by the U.S. Fish and Wildlife Service (USFWS) in May 1998. Both species are known to occur at RFETS and, although

161

these species represent essentially the same functional group (herbivorous burrowing small mammals), they are listed here because of their special legal and/or policy status. A generalized small mammal (for example, deer mouse) was also evaluated as a representative receptor. The deer mouse was evaluated using two models and varying only the assumed diet (herbivorous versus insectivorous).

The risk to small ground-feeding birds was not previously assessed in the Watershed ERA. Several candidate species known from RFETS (DOE 1995) include dark-eyed junco (*Junco hyemalis*), black-headed grosbeak (*Pheucticus melanochephalus*), lazuli bunting (*Passerina amoena*), spotted and green-sided towhees (*Pipilo chlorurua* and *P. erythrophthalmus*), mourning dove (*Zenaida macroura*), and house finch (*Carpodacus mexicanus*). The mourning dove was used by EPA in developing Eco-SSLs and was selected to represent ground-feeding birds due to the abundance of available information necessary to estimate intake and therefore risk.

In addition to the above receptor groups, ESLs were developed for the American kestrel (*Falco sparverius*), a small falcon that is abundant in the region around RFETS. The kestrel does not have intimate contact with the soil, but represents an upper level consumer that could be exposed to contaminants that accumulate in prey species. The mule deer (*Odocoileus hemionus*) was selected to represent large mammalian herbivores. A population of mule deer currently inhabit the Site. Finally, the coyote (*Canis latrans*) was selected as the mammalian predator. The coyote represents the upper level mammalian consumer that could also be exposed to ECOIs at the site.

In the upland areas of the Site, terrestrial invertebrates and plants will be evaluated as receptors. In the drainages, the general aquatic community will also be evaluated as a receptor. For terrestrial plants and invertebrates, and aquatic community receptors, the toxicity benchmarks are not species-specific but are community-based and designed to be protective of most species within the receptor class. Therefore, the entire community of species that make up the population of each receptor group at RFETS will be evaluated as a whole.

Receptor-specific parameters necessary to implement the exposure estimation described in Section 3.1 are listed in Table B-1. When ESLs are used to evaluate an exposure unit (EU) that consists of only one home range, it is necessary that the ESL accounts for the behavior-based variability in exposure. That is, the ESL is calculated from the dose-based TRV using one or more exposure assumptions that are "high-end," rather than all "average" exposure values. This ensures that when the ESL is applied to the mean concentration in an exposure area, it estimates the risk to a high-end receptor rather than an average receptor. This is appropriate for the large, wide-ranging receptors given that they will be evaluated on a Sitewide basis in the CRA.

When ESLs are applied to an exposure area that includes many home ranges (that is, for the receptors with small home ranges), the result is a distribution of HQ values across the EU that characterizes the variation due to differences in concentrations across several home ranges. In this situation, the ESL calculation is based on an individual with average (rather

162

than high-end) exposure parameters, because the variation in mean concentration between home ranges is typically large compared to the variation in exposures within a home range due to differences in behavior.

3.0 METHODS FOR TASK 2: IDENTIFYING AND SELECTING TOXICITY REFERENCE VALUES AND BIOACCUMULATION FACTORS FOR VERTEBRATE SOIL SCREENING LEVEL CALCULATION

This section provides the procedures followed to select TRVs and BAFs that are used for calculation of ESL values.

3.1 Derivation of Toxicity Reference Values for Vertebrate Receptors

As noted in Section 2.0, EPA's Eco-SSL (EPA 2003a) process was generally followed to identify the more relevant TRVs for representative species types. Figure B.1 presents a graphical view of the TRV selection process for vertebrate receptors. Table B-1 presents the receptor-specific input parameters used in the ESL calculations.

3.1.1 Previously Published Toxicity Reference Values

The major sources of toxicity information for deriving TRVs are publicly available databases of TRVs and no-observed adverse effects level/lowest-observed adverse effects level (NOAEL/LOAEL) values presented in peer reviewed literature sources. This information was obtained, as available, for the ECOIs listed in Table B-2.

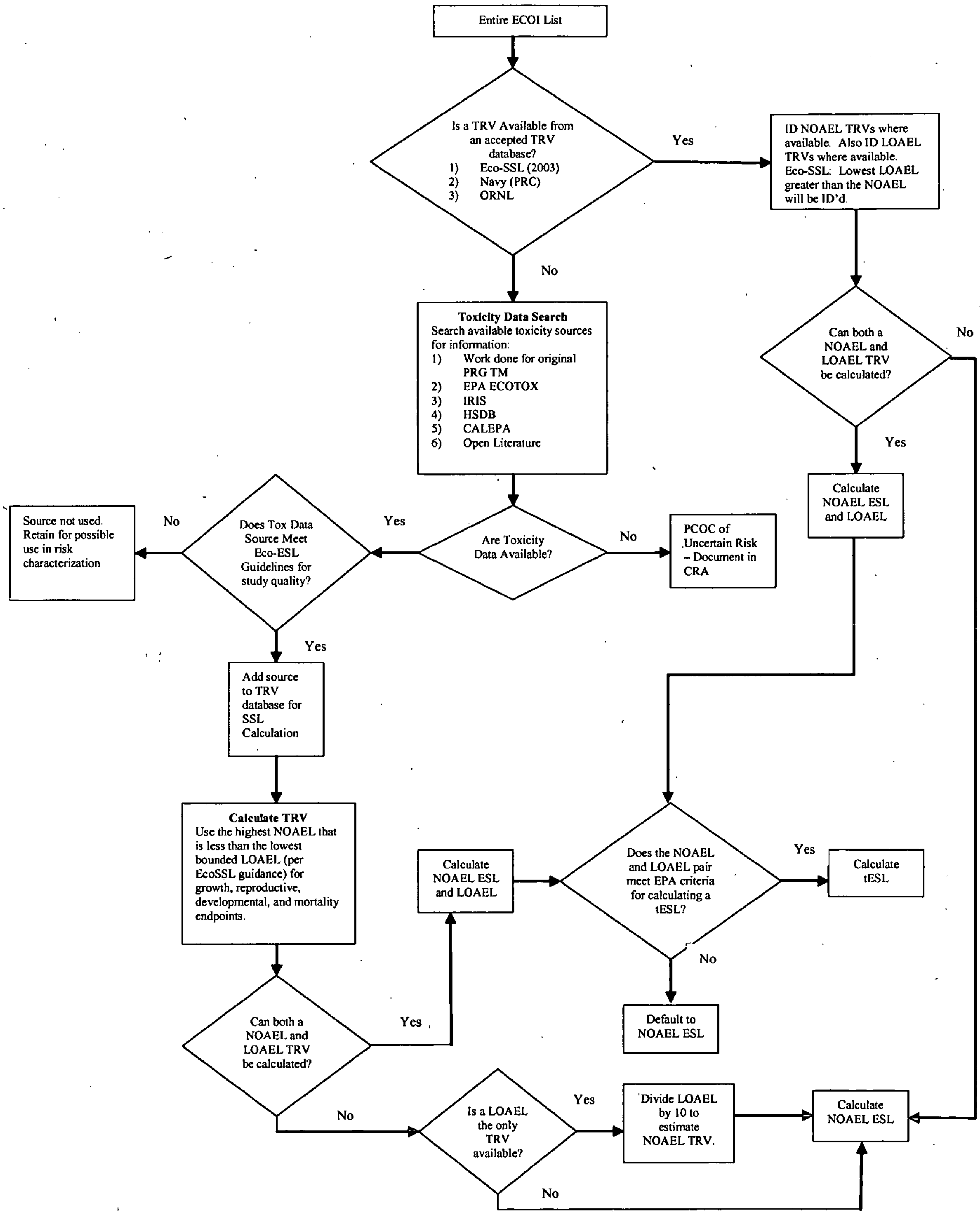
The following hierarchy of resources was searched for toxicological information to provide previously published TRVs:

1. EPA's guidance for developing Eco-SSLs (EPA 2003a);
2. TRVs developed for U.S. Navy facilities in California (PRC 1994); and
3. Benchmarks developed for the Oak Ridge National Laboratory (ORNL) (Sample et al. 1996).

The three sources were determined to have adequate data quality to be used in the RFETS ESL calculations. Therefore, TRVs presented in these sources were used unedited from the original source regardless of manipulations of study information by the authors. If both a NOAEL and LOAEL TRV are identified and the data are of sufficient quality to calculate a threshold-level ESL (tESL) (Section 3.1.4), a threshold value that represents the geometric mean between the two values is presented in order to calculate a tESL.

163

Figure B.1 – TRV Identification Process for Vertebrate ESLs



164

3.1.2 Literature Review of Toxicity Data

The sources presented in the previous section provided TRVs for a limited list of ECOIs. It was therefore necessary to perform a more detailed search for toxicity information for the remaining list of ECOIs in order to develop TRVs for use at RFETS. A database of TRVs identified from literature sources was compiled and is presented in Table B-2. The available TRVs for the Site soil-associated ECOIs are based on the following criteria:

- Oral exposure studies from which a dose was calculable;
- Reproductive and developmental endpoints for chronic and subchronic exposure or acute exposure during discrete, critical lifestage; and
- Growth and mortality endpoints. As per the Eco-SSL guidance, these are used as upper-bound TRVs in case reproduction/developmental TRVs are higher than longer-term exposure survival endpoints.

The literature search strategy was very focused given the relatively large number of chemicals for which TRVs were needed. In order to maximize the efficiency and output of the search, it was determined that several preeminent sources of peer-reviewed studies for mammals would be utilized, rather than conducting a broad-based literature search. The initial sources that were reviewed for toxicity literature were the Centers for Disease Control's Agency for Toxic Substances and Disease Registry (ATSDR) toxicity profiles and EPA's Integrated Risk Information System (IRIS) chemical-specific health assessments. These sources were searched for reproductive and developmental effects as well as effects on chronic growth and survival. The search focused on studies utilizing oral ingestion from food or oral gavage for development of the TRVs. Although the search was conducted using a streamlined approach for identifying relevant toxicity studies, the use of IRIS and ATSDR will result in identification of appropriate critical studies for use in developing chemical specific TRVs.

ATSDR toxicity profiles that matched the RFETS chemical names or synonyms were selected. In addition to chemical names, CAS numbers were used to match RFETS chemicals to IRIS health assessments. Both the ATSDR and IRIS sources summarize available toxicity information and provide citations for the referenced toxicity studies for chemicals that have been evaluated. Where feasible, the articles cited in the ATSDR and IRIS sources were physically obtained and used in the TRV data extraction and evaluation process.

Each of the sources of TRVs were evaluated for data quality using the EPA (2003a) Eco-SSLs 10-step scoring system that is described in detail in Attachment 4-4 of EPA (2003a). The results of the scoring are presented in Attachment 1. If the evaluation resulted in a score of 65 or greater, the TRV was accepted for use and is presented in Attachment 2.

Where sufficient data were available (Attachment 2), TRVs were calculated by obtaining the highest NOAEL that is lower than the lowest bounded LOAEL, for the applicable endpoints. The NOAEL and LOAEL TRVs used were compiled from the literature review for endpoints

165

discussed above. The ECOIs that have inadequate toxicity data from which to calculate a TRV will be discussed qualitatively in the CRA Report.

ATSDR and IRIS focus primarily on mammalian toxicity data; neither are primary sources for avian toxicity data. As a result, EPA's ECOTOX database and the Hazardous Substance Databank (HSDB) were searched for avian toxicity data. These data underwent a scoring and extraction process analogous to that used for mammals (Attachments 1 & 2).

3.1.3 Ecological Contaminants of Interest with Minimal or Insufficient Data

For some ECOIs, both a NOAEL and a LOAEL TRV are not available for both mammalian and avian receptors. Where only a LOAEL TRV was available, the NOAEL was estimated by dividing the LOAEL TRV by 10. No estimates of a missing LOAEL value were made. In addition, no interclass extrapolations were used to estimate avian TRVs from mammalian endpoints. No ESLs were calculated when no class-specific data were available for the ECOI; these will be noted and discussed in the uncertainty section of the CRA. The use of surrogate chemicals to evaluate ECOI toxicity will be reviewed on a case-by-case basis.

For ECOIs where some toxicity data have been identified but the data are limited in either the quality of endpoints identified, test species evaluated, or studies identified, uncertainty factors have been applied in order to provide a level of comfort that the TRV is of a conservative nature. Uncertainty factors have been applied to the TRVs in Table B-2 if the following cases apply:

1. If a TRV is based on data from only one species, an uncertainty factor is needed to guard against the possibility that the TRV for that species in near the middle or upper end of the species sensitivity distribution. Based on the inter-species variability data reported in USEPA (1996), an uncertainty factor of 10 will be used to include at least 78% of the potential for variability in inter-species sensitivities.

2. If a TRV is based on lethality only (no data on growth or reproduction), an uncertainty factor is needed to guard against the possibility that the TRV for these endpoints is substantially lower than for lethality. The CRA Workgroup decided in consultation that an uncertainty factor equal to 5 would be adequately conservative for use in this case.

If both conditions apply (only one species, only lethality data), the Risk Assessment Work Group has determined that the database is too weak to support the development of a credible TRV and that no TRV will be derived (rather than applying a combined uncertainty factor of 50). The data for these TRVs are presented in Table B-2 but are noted as unacceptable. TRVs noted as unacceptable in Table B-2 will not be used for screening purposes but will be discussed in the Uncertainty section of the CRA.

3.1.4 Calculation of Threshold Toxicity Reference Values

The ecological contaminant of potential concern (ECOPC) identification process in the CRA Methodology specifies that if the toxicity data for a particular ECOI are of sufficient quality,

166

a tESL was calculated. Ideally, the TRV used is the threshold dose at which the response in a group of exposed organisms first begins to be significantly greater than in unexposed receptors. The threshold dose is seldom known, but is bounded between two experimental values:

- NOAEL = Highest administered dose that did not cause an effect; and
- LOAEL = Lowest administered dose that did cause an effect.

If the NOAEL and LOAEL are both close to the threshold, then the geometric mean of the two values is likely to be a reasonable estimate of the true threshold dose. However, if neither the NOAEL and/or the LOAEL is close to the threshold, then the geometric mean may not be a reliable estimate of the threshold. Several different cases may be distinguished, as shown below:

NOAEL	LOAEL	Estimated Threshold
Close	Close	Reliable
Too low	Close	Underestimate
Close	Too high	Overestimate
Too low	Too High	Unknown (unreliable)

Because of the potential error that might occur in an estimate of the threshold when neither the NOAEL and/or the LOAEL is close to the true threshold, a data quality rule is needed in order to judge whether the NOAEL/LOAEL data are sufficient to allow the derivation of a reliable estimate of the threshold. The data quality rule is as follows:

"A threshold was only calculated if the LOAEL represents a response that is at the low end of the dose response curve (for example, LOAEL < the 20 percent effects concentration [EC20])."

There is no requirement regarding the value of the NOAEL.

This approach minimizes the hazard that the threshold will be significantly too high by limiting the type of LOAEL that is acceptable. It is recognized that by accepting cases where the NOAEL is far below the LOAEL, the chances are increased the threshold will be far too low, but this error is conservative (protective) and may be preferable to using the NOAEL alone.

3.1.5 TRV Confidence

The quality of the TRV database for each ECOI is variable due to a number of factors as discussed in previous sections. While some ECOIs have been researched extensively, others have minimal amounts of data directly applicable to ECOPC selection. It is, therefore, important to highlight the quality of the TRV database for each ECOI. A qualitative 6-point

167

scale has been identified by the Risk Assessment Work Group that provides a quick guide to the confidence that should be placed on each TRV selected for use in the ECOPC identification process. Each ECOI listed in Table B-2 is assigned a TRV Confidence rating based on one of the following categories:

1. NA – No TRV has been identified or the TRV has been deemed unacceptable for use in ECOPC selection. Those TRVs deemed unacceptable for use will be retained for use in the Uncertainty section of the CRA as necessary.

2. Low – TRVs that have data for only one species looking at one endpoint (non-mortality) and from one primary literature source.

3. Moderate – TRVs that have multiple primary literature sources looking at one endpoint (non-mortality or mortality) but with only one species evaluated.

4. Good – For TRVs that have either multiple species with one endpoint from multiple studies or those TRVs with multiple species and multiple endpoints from only one study.

5. High –For TRVs that have multiple study sources looking at multiple endpoints and more than one species. By default, all obtained TRVs from the Sample et al (1996) and Navy (PRC, 1994) documents will receive a 'High' confidence rating.

6. Very High – All EcoSSLs (EPA 2003a) will be assigned this level of confidence by default. This rating represents the highest quality of TRV currently only available for the ECOIs that have been heavily researched in the EcoSSL process.

The six ratings levels for TRV confidence will be discussed in the Uncertainty Section of the CRA. The discussion will focus on the implications of using a TRV at each of the confidence levels in a screening-level ERA. The uncertainty section will also provide a list of ECOIs that are detected in the EU that have 'Low' or 'Moderate' confidence level. The results of the screening-level ecological risk assessment for each of the ECOIs that receive the 'Low' or 'Moderate' level will be reviewed on a case-by-case basis as necessary.

3.2 Bioaccumulation Factor Selection for Calculation of Vertebrate Receptor Ecological Screening Levels

As discussed in Section 2.0, BAFs were identified and calculated for use in the ESL development process. The procedures used in this process closely correspond to those developed in the Eco-SSL guidance (EPA 2003a). Consistent with the Eco-SSL guidance, BAFs are either simple ratios of ECOI concentrations between biota and soil or are based on quantitative relationships such as linear, logarithmic, or exponential equations.

BAFs were calculated or identified for the following pathways:

- Soil-to-plant

1168

- Soil-to-terrestrial invertebrate
- Soil to small mammals or birds

Several sources of BAFs were available for some ECOIs. In cases where more than one BAF was available, the following hierarchy was utilized;

1. Oak Ridge National Laboratory BAFs for plants, terrestrial invertebrates, and small mammals – This series of three documents (Sample et al. 1998a, 1998b, and ORNL 1998) provide high quality BAFs derived from large datasets for many inorganic and organic ECOIs. The BAFs recommended in each of the documents, whether a BAF or linear regression) were used and are presented on Table B-3 A.

2. EPA Eco-SSL Guidance (EPA 2003a) – Several ECOIs had plant, terrestrial invertebrate, or small mammal BAFs derived for use in this document. BAFs specifically derived for the Eco-SSL Guidance were used as presented in Attachment 4-1 of the Guidance documents and are listed in Table B-3 A.

3. For inorganic ECOIs, soil-to-plant and soil-to-small mammal BAFs from Baes et al. (1984) were used when none were available in either of the two sources listed above. Baes et al. (1984) provides BAFs for all elements on the periodic table of elements calculated by tracing uptake of materials either into plant tissues (leaves) or beef. While the BAFs used in this step are of adequate quality for use in ECOPC identification, they are based on a much smaller and more narrow dataset than the two BAF sources discussed above (Table B-3 A).

4. For organic ECOIs with no empirically calculated BAFs available in the first two sources, Log Kow equations as presented and modified in the EPA Eco-SSL (EPA 2003a) Guidance document were used to estimate BAFs. These values are more uncertain than empirically-based BAFs, but are acceptable for use in ECOPC identification. The BAFs calculated using these equations are presented in Table B-3 B.

5. For non-bioaccumulative inorganic ECOIs that have no soil-to-terrestrial invertebrate BAFs available, a default value equal to 1 was used.

Specific sources used to obtain the BAFs presented in Tables B-3 A and B-3 B are listed on their respective tables.

3.3 Identification of Sediment Ecological Screening Levels

A variety of published sources of benchmarks were reviewed for use as ESLs. Prior to beginning the task of identifying sediment benchmarks, the RFETS sediment database was queried to determine which ECOIs discussed in the soil ESL process were detected in sediments at RFETS. The ECOIs that were detected at least once in sediments are listed in Table B-4. The sediment ESLs presented in Table B-4 represent threshold or no effects levels and were obtained from the following hierarchy of sources.

169

1. Consensus-based threshold effects concentrations (TECs) from MacDonald et al. (2000a,b) - Consensus TECs represent a source of quality threshold concentrations that were compiled from published TECs from multiple sources.

2. Interim sediment quality guidelines (ISQGs) from the Canadian environmental quality guidelines (CCME 2002) - Several ISQGs are presented in Table B-4 for those ECOIs that had no TECs identified in the first set of sources. ISQGs are conservative, low-end threshold or no effects concentrations.

3. Equilibrium partitioning values (EqPs) – For non-ionic organic ECOIs lacking consensus TECs or ISQGs but with surface water ESLs available, EqP criteria were calculated using the soil partitioning coefficient (K_{oc}) and fraction of organic carbon in sediments (f_{oc}). The equation used (EPA 1997b) was: $EqP = ESL_{water} * K_{oc} * f_{oc}$. EqP ESLs are based on the theory that the pore water in sediment is the point of contact for most benthic aquatic organisms and that the concentration in pore water is related to the organic content in sediments and the soil portioning coefficients. Values for all of the equation parameters are presented in Table B-4.

4. For those ECOIs with no ESLs identified in any of the three sources listed above, a compendium of sediment ESLs (MacDonald et al. 1999) was consulted in order to identify an ESL of adequate quality for use. When MacDonald et al. (1999) was used and more than one sediment ESL was available, the highest conservative screening level value (i.e. TEL, LEL, NEL, ERL) from applicable water body types was selected for use and are presented in Table B-4..

5. No acceptable ESLs were identified for several sediment ECOIs. Those ECOIs without ESLs are identified in Table B-4 and will be discussed qualitatively in the CRA. Identification of Surface Water Ecological Screening Levels

Similar to the sediment ESLs discussed above, surface water ESLs were identified from several published databases of surface water quality criteria (Table B-5). These concentrations represent the potential for toxic effects to the aquatic community. Two ESLs were identified, where possible, for each ECOI detected in a surface water or groundwater sample at RFETS. An acute and chronic ESL was identified from the following hierarchy of sources: Colorado Department of Public Health and Environment (CDPHE) Regulation Number 31 (5 Colorado Code of Regulations [CCR] 1002-31), EPA (1999b, 2002), MIDEQ (2003), CCME (2002), Suter and Tsao (1996), and NY State (1998).

3.4 Identification of Soil Screening Levels for Soil Invertebrates

ESLs were identified for soil invertebrates and are presented in Table B-6. As with surface water and sediments these ESLs are represented by a concentration in soil below which no effects are expected. A relatively large database of soil ESLs is available for earthworm toxicity. These ESLs, however, are highly conservative for use in the CRA due to the general lack of earthworm species at the Site. Earthworms are generally more susceptible to effects from contamination than are other invertebrates due to the degree of contact during burrowing and their thin epidermis that provides them with very little protection. However,

\170

given the scarcity of non-earthworm ESLs and the intended conservatism inherent in the ECOPC identification process, the earthworm ESLs were used.

Earthworm ESLs have been compiled in the Eco-SSL guidance documents (EPA 2003a) for several ECOIs and in a document from Oak Ridge National Laboratories (Efroymson et al. 1997a). Where ESLs were available in the Eco-SSL (EPA 2003a) document, they were given priority over the ESLs from Efroymson et al. (1997a).

No ESLs were identified for several ECOIs. ECOIs with no terrestrial invertebrate ESLs will be discussed qualitatively in the CRA.

3.5 Identification of Soil Screening Levels for Terrestrial Plants

ESLs that can be used to predict the potential for no effects to terrestrial plant communities were also identified for the entire list of soil ECOIs (Table B-6). Terrestrial plant ESLs are typically concentrations of ECOIs in soil below which no adverse effects are expected. Plant ESLs calculated in the EPA Eco-SSL Guidance (EPA 2003a) were given priority over all other values. Another set of ESLs is also available from Oak Ridge National Laboratories (Efroymson et al. 1997b). These values were used for those ECOIs that lacked plant ESLs from the Eco-SSL Guidance document.

No ESLs were identified for several ECOIs. ECOIs with no plant ESLs will be discussed qualitatively in the CRA.

4.0 ECOLOGICAL SCREENING LEVELS

The ESLs represent generic concentrations below which little to no risk is predicted to populations of receptors potentially inhabiting RFETS. Tables B-4 through B-7 present the ESLs for the receptors presented in Table B-1. Benchmark ESL values for aquatic life in sediment and surface water are presented in Tables B-4 and B-5 and benchmark ESLs for terrestrial invertebrates and plants are presented in Table B-6. Vertebrate ESLs are presented in Table B-7. Table B-8 presents the radionuclide ESLs. The ESL calculations for all ECOIs are presented in Attachment 4.

5.0 REFERENCES

Abdo, K.M., C.A. Montgomery, and W.M. Kluwe,1984, Toxicity of hexachlorocyclopentadiene: Subchronic (13-week) administration by gavage to F344 rats and B6C3Fl mice. J Appl Toxicol 4:75-81.

Abdul, A.S., T.L. Gibson, and D.N. Rai, 1987, Statistical Correlations for Predicting the Partition Coefficient for Nonpolar Organic Contaminants Between Aquifer Organic Carbon and Water, Haz. Waste Haz. Mat., 4:211-22.

Ainsworth, C.C., J.M. Zachara, and S.C. Smith, 1989, Carbazole Sorption by Surface and Subsurface Materials: Influence of Sorbent and Solvent Properties, Soil Sci. Soc. Am. J., 53:1391-1401.

191

Aldredge, A.W., J.F. Lipscomb, and F.W. Whicker, 1974, "Forage Intake Rates of Mule Deer Estimated with Fallout Cesium-137," Journal of Wildlife Management, 38:508B516.

Alvarez, L, A. Randi, and P. Alvarez, 2000, Reproductive effects of hexachlorobenzene in female rats. J Appl Toxicol 20:81-87.

American Cyanamid Company (as cited in IRIS), 1979, MRID No. 00026671, 00059470, 00106762. Available from EPA. Write to FOI, EPA, Washington, D.C. 20460.

American Cyanamid Company (as cited in IRIS), 1986, MRID No. 00164177, 40545501. Available from EPA. Write to FOI, EPA, Washington, DC 20460.

Anderson, A.E., D.E. Medin, and D.C. Bowden, 1974, "Growth and Morphometry of the Carcass, Selected Bones, Organs, and Glands of Mule Deer," Wildlife Monographs, 39:1B122.

Argus Research Laboratories. 1997. Oral (gavage) developmental toxicity study of phenol in rats. Horsham, PA. Protocol number: 916-011.

Arnold, D.L., C.A. Moodie, and S.M. Charbonneau, 1985, Long-term toxicity of hexachlorobenzene in the rat and the effect of dietary vitamin A. Food Chem Toxicol 23:779-793.

Baes, C.F., R.D. Sharp, A.L. Sjoreen, and R.W. Shor, 1984, A review and analysis of parameters for assessing transport of environmentally released radionuclides through agriculture. Oak Ridge National Laboratory. USDOE> ORNL-5786. September 1984.

Barnes, D.W., V.M. Sanders, and K.L. White, Jr., 1985. Toxicology of trans-1,2-dichloroethylene in the mouse. Drug Chem Toxicol 8:373-392.

Bekoff, M., 1977, Canis latrans, Mammalian Species, 79:1-9.

Belpoggi, F., M. Soffritti, and C. Maltoni, 1995, Methyl-tertiary-butyl ether (MTBE), a gasoline additive, causes testicular and lymphohaematopoietic cancers in rats. Toxicol Ind Health 11: 119-149.

Beyer, N.M, E.E. Connor, and S. Gerould, 1994, "Estimates of Soil Ingestion by Wildlife", Journal of Wildlife Management, 58(2):375-382.

Blackburn, K, H., Zenick, and E. Hope, 1986, Evaluation of the reproductive toxicology of 2,4,6-trichlorophenol in male and female rats. Fundam Appl Toxicol 6:233-239.

Borriston Laboratories, Inc., 1984, Four-week oral nephrotoxicity screening study in male F344 rats.EPA Document No. FYI-AX-0784-0280.

Borzelleca, J.F., P.S. Larson, G.R.Hennigar, Jr, E.G.Huf, E.M. Crawford, and R.B. Smith, Jr. 1964, Studies on the chronic oral toxicity of monomeric ethyl acrylate and methyl methacrylate. Toxicol. Appl. Pharmacol. 6:29-36.

172

Boyd, S.A., 1982, Adsorption of Substituted Phenols by Soil, Soil Science, 134:337-43.

Briggs, G.G., 1981, Theoretical and Experimental Relationships Between Soil Adsorption, Octanol-Water Partition Coefficients, Water Solubilities, Bioconcentration Factors and the Parachor, J. Agric. Food Chem., 29:1050-9.

Brown, L. and D. Amadon, 1968, Eagles, Hawks, and Falcons of the World: Volume 1, New York: McGraw-Hill.

Bruckner, J.V., W.F. MacKenzie, and R. Ramanathan, 1989, Oral toxicity of 1,2-dichloropropane: Acute short-term and long-term studies in rats. 12:713-730.

Cabral, J.R.P., T. Mollner, and F. Raitano, 1979, Carcinogenesis of hexachlorobenzene in mice. Int J Cancer 23:47-51.

CalEPA, 2004, EcoTox Database, Online: http://www.oehha.ca.gov/ecotox/documents/caleco1.html.

CCME, 1999, Canadian Environmental Quality Guidelines, Chapter 7, Soil, Canadian Council for the Ministries of the Environment, Publication No. 1299, Winnipeg, Canada.

CCME, 2002, Canadian Environmental Quality Guidelines; Canadian Council of Ministers of the Environment, Winnipeg, Canada.

CDPHE Regulation Number 31 (5 CCR 1002-31).

CDPHE, 2002, Colorado Department of Public Health and Environment; Regulation No. 38 Classifications and Numeric Standards South Platte River Basin.

Chin, Y.P. and W.J. Weber, Jr., 1989, Estimating the Effects of Dispersed Organic Polymers on the Sorption of Contaminants by Natural Solids: A Predictive Thermodynamic Humic Substance-Organic Solute Interaction Model, Environ. Sci. Technol., 23:978-84.

Chiou, C.T., L.J. Peters, and V.H. Freed, 1979, A Physical Concept of Soil-Water Equilibria for Non-Ionic Organic Compounds, Science, 206:831-2.

Chu, I., D.C. Villeneuve, V.E. Valli, and V.E. Secours, 1984, Toxicity of 1,2,3,4-, 1,2,3,5- and 1,2,4,5-tetrachlorobenzene in the rat: Results of a 90-day feeding study. Drug Chem. Toxicol. 7: 113-127.

Courtney, K.D., M.F. Copeland, and A. Robbins, 1976, The effects of pentachloronitrobenzene, hexachlorobenzene, and related compounds on fetal development. Toxicol Appl Pharmacol 35:239-256.

Cowan, J.B, 1952, "Life history and productivity of a population of western mourning doves in California", California Fish and Game, 38(4):505-521.

183

Cronin, K.L. and E.L., Bradley, 1988, "The Relationship Between Food Intake, Body Fat and Reproductive Inhibition in Prairie Deer Mice (Peromyscus maniculatus bairdii)", Comparative Biochemistry and Physiology, 89:669-673.

Daelemans, A. and H. Siebering, 1977, Distribution of Methyl Bromide Over the Phases in Soil, Meded. Fac. Landbouwwet, Rijksuniv. Gent., 42:1729-38.

Danse, L.H., F.L. van Velsen, and C.A. Van Der HeLJden, 1984, Methylbromide: Carcinogenic effects in the rat forestomach. Toxicol Appl Pharmacol 72:262-271.

Delaune, R.D., R.P. Gambrell, and K.S. Reddy, 1983, Fate of Pentachlorophenol in Estuarine Sediment, Environ. Pollut. (Series B), 6:297-308.

Den Tonkelaar, E.M., F.X.R. Van Leeuwen, and C. Kuiper, 1983, Semichronic toxicity testing of DNOC in the rat. Meded Fat Landbouwwet Rijksuniv Gent 48:1015-1022.

DHEW/NCI; Bioassay of Phthalic anhydride for Possible Carcinogenicity p.v. 1979. Technical Rpt Series No. 159 DHEW Pub No. (NIH) 79-1715.

Dilley, J.V., C.A. Tyson, and R.J. Spanggord, 1982, Short-term oral toxicity of 2,4,6-trinitrotoluene in mice, rats, and dogs. J Toxicol Environ Health 9(4):565-585.

DOD (as citied in IRIS), 1981, AD-A108 447, Available from Defense Technical Center. Write to Documents, Cameron Station, Alexandria, VA 22314, or call (703)274-7633.

DOD (as citied in IRIS). 1985. AD-A171 601. Available from Defense Technical Information Center. Write to Documents, Cameron Station, Alexandria, Virginia 22314, or call (703)274-7633.

DOE, 1995, Draft Final Phase I RFI/RI Report, Woman Creek Priority Drainage Operable Unit No. 5, U.S. Department of Energy, Rocky Flats Environmental Technology Site, Golden, Colorado, Appendix N, October.

DOE, 1996a, Final Ecological Risk Assessment Methodology: Technical Memorandum Sitewide Conceptual Model, U.S. Department of Energy, Rocky Flats Environmental Technology Site, Golden, Colorado, June.

DOE, 1996b, Ecological Risk Assessment Methodology, Technical Memorandum: Ecological Chemicals of Concern (ECOCs) Screening Methodology, RF/ER-96-0039, June.

DOE, 1996c, (Suter and Tsao Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effect on Aquatic biota).

DOE, 2003, RESRAD-BIOTA Code, available at http://homer.ornl.gov/oepa/public/bdac.

DOE, EPA, and CDPHE, 1996, Rocky Flats Cleanup Agreement, Joint Agreement between the U.S. Department of Energy, U.S. Environmental Protection Agency, Colorado Department of Public Health and Environment, and the State of Colorado, July 19.

Dow Chemical Company (as cited in IRIS), 1959, MRID No. 00062676. Available from EPA. Write to FOI, EPA, Washington, D.C. 20460.

Efroymson, R.A., M.E. Will, and G.W. Suter II, 1997a, Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process, 1997 Revision, ES/ER/TM-126/R2, DOE, Lockheed Martin Energy Systems, Inc.

Efroymson, R.A., M.E. Will, G.W. Suter, II, and A.C. Wooten, 1997b, Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants, 1997 Revision, ES/ER/TM-85/R3, DOE, Lockheed Martin Energy Systems, Inc.

Elanco Product Company (as cited in IRIS), 1984, MRID No. 00152419, 00152421. Available from EPA. Write to FOI, EPA, Washington D.C. 20460. Trifluralin.

Ellis, H.V., J.H. Hagensen, and J.R. Hodgson, 1979, Mammalian toxicity of munitions compounds. Phase BI: Effects of lifetime exposure. Part I. 2,4-Dinitrotoluene. Final report no. 7. Midwest Research Institute, Kansas City, MO. Contract no. DAMD 17-74-C-4073, ADA077 692.

EPA, 1986a, Rat Oral Subchronic Study with Ethyl Acetate. Office of Solid Waste, Washington, D.C.

EPA, 1986b, o, m, p-Cresol. 90-Day oral Subchronic Toxicity Studies in Rats. Office of Solid Waste, Washington, D.C.

EPA, 1986c, 2,3,4,6-Tetrachlorophenol. 90-Day Subchronic Oral Toxicity Study in Rats. Office of Solid Waste, Washington, D.C.

EPA, 1986d, Rat oral subchronic study with ethyl ether. Prepared by American Biogenics Corporation for the Office of Solid Waste, Washington, D.C.

EPA, 1987, o, m, p-Cresol. 90-Day oral subchronic neurotoxicity study in rats. Office of Solid Waste, Washington, D.C.

EPA, 1988, 13-week mouse oral subchronic toxicity study. Prepared by Toxicity Research Laboratories, ltd., Muskegon, MI for the Office of Solid Waste, Washington, D.C.

EPA, 1989a, Mouse Oral Subchronic Study with Acenaphthene. Study conducted by Hazelton Laboratories, Inc., for the Office of Solid Waste, Washington, D.C.

EPA, 1989b, Mouse Oral Subchronic Toxicity Study. Prepared by Toxicity Research Laboratories, LTD., Muskegon, MI for the Office of Solid Waste, Washington, D.C. (fluorene)

EPA, 1989c, Mouse Oral Subchronic Toxicity of Pyrene. Study conducted by Toxicity Research Laboratories, Muskegon, MI for the Office of Solid Waste, Washington, DC.

EPA, 1989d, Subchronic study in mice with beta-Chloronaphthalene. HLA Study No. 2399-124. Prepared by Hazleton Laboratories America, Inc. for the U.S. EPA, Office of Solid Waste, Washington D.C.

EPA, 1989e, Subchronic toxicity in mice with anthracene. Final Report. Hazelton Laboratories America, Inc. Prepared for the Office of Solid Waste, Washington, D.C.

EPA, 1993, Wildlife Exposure Factors Handbook, Volumes I and II, Office of Research and Development, EPA/600/R-93/187a, Washington D.C., December.

EPA, 1996, Use of Uncertainty Factors in Toxicity Extrapolations Involving Terrestrial Wildlife, Technical Basis, Office of Research and Development, September.

EPA, 1997a, Ecological Risk Assessment for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final, U.S. Environmental Protection Agency, Washington, D.C., July.

EPA, 1997b, The Incidence And Severity of Chemical Contamination of Surface Waters of the United States, Volume 1: National Sediment Quality Survey, EPA 823-R-97-006, Office of Science and Technology.

EPA, 1999a, Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Office of Solid Waste and Emergency Response, EPA530-D-99-001A, August.

EPA, 1999b, National Recommended Water Quality Criteria, Correction Document, EPA 822-Z-99-001, April.

EPA, 2002, National Recommended Water Quality Criteria, 2002 Update, Office of Science and Technology, EPA-822-R-02-047, November.

EPA, 2003a, Guidance for Developing Ecological Soil Screening Levels, OSWER Directive #92857-55, Office of Solid Waste and Emergency Response, November.

EPA, 2003b. Provisional Peer Reviewed Toxicity Values (PPRTV) Derivation Support Document for 1,3,5-Trimethylbenzene (Mesitylene, CASRN 108-67-8) (reevaluated in August 2003). The Office of Research and Development/National Center for Environmental Assessment/SuperfundHealth Risk Technical Support Center (STSC). (SRC TR-02-021/08-2003).

EPA, 2003c. Provisional Peer Reviewed Toxicity Values (PPRTV) Derivation Support Document for: 1,2,4-Trimethylbenzene (CASRN 95-63-6) and 1,3,5-Trimethylbenzene (CASRN 108-67-8) (reevaluated in August 2003). The Office of Research and Development/National Center for Environmental Assessment/ SuperfundHealth Risk Technical Support Center (STSC). (98-023 / 8-03).

EPA, 2004, Toxics Release Inventory Program; available at www.epa.gov/tri..

176

Exon, J.H. and L.D. Koller, 1981, Alteration of transplacental carcinogenesis by chlorinated phenols. In: Jolley RL, Brungs WA, Cotruvo WA, et al., (eds) Water Chlorination: Environmental Impact and Health Effects, Volume 4, Book 2. Ann Arbor, Michigan: Ann Arbor Science, 1177-1188.

Exon, J.H., and L.D. Koller, 1982, Effects of transplacental exposure to chlorinated phenols. Environ Health Perspect 46:137-140.

Exon, J.H. and L.D. Koller, 1983, Effects of chlorinated phenols on immunity in rats. Int J Immunopharmacol 5(2):131-136.

Exon, J.H. and L.D. Koller, 1985, Toxicity of 2-chlorophenol, 2,4-dichlorophenol and 2,4,6-trichlorophenol, In: Jolley RL, ed. Water Chlorination: Chemistry, environmental impact and health effects. Volume 5. Fifth Conference on Water Chlorination: Environmental Impact and Health Effects, Williamsburg, Virginia, June 1984, 307-330.

Flake, L.D, 1973, "Food Habits of Four Species of Rodents on a Short-Grass Prairie in Colorado," Journal of Mammalogy, 54:636-647.

Giavini, E., C. Vismara, and M.L. Broccia. 1985. Teratogenesis Study of Dioxane in Rats. Tolicol. Letters V 26(1):85-8.

Giavini, E., M.L. Broccia, and M. Prati, 1986, Teratologic evaluation of p-dichlorobenzene in the rat. Bull Environ Contam Toxicol 37:164-168.

Gibson, J.E., 1973, Teratology studies in mice with 2-secbutyl-4, 6- dinitrophenol (dinoseb). Food Cosmet. Toxicol. 11: 31.

Gier, H.T, 1975, "Ecology and Behavior of the Coyote (Canis latrans)," In The Wild Canids, M.W, Fox, Ed, New York: Van Nostrand Reinhold.

Gorzinski, S.J., R.J. Nolan, S.B. McCollister, R.J. Kociba, and J.L. Mattsson, 1985, Subchronic oral toxicity, tissue distribution and clearance of hexachloroethane in the rat. Drug Chem. Toxicol. 8(3): 155-169.

Grant, D.L., W.E. Phillips, and G.V. Hatina, 1977, Effect of hexachlorobenzene on reproduction in the rat. Arch Environ Contam Toxicol 5:207-216.

Gray, L.E., C. Wolf, and C. Lambright, 1999, Administration of potentially antiandrogenic pesticides (procymidone, linuron, iprodione, chlozolinate, p,p'-DDE, and ketoconazole) and toxic substances(dibutyl- and diethylhexyl phthalate, PCB 169, and ethane dimethane sulphonate) during sexual differentiation produces diverse profiles of reproductive malformations in the male rat. Toxicol Ind Health 15(1-2):94-118.

Hamaker, J.W. and J.M. Thompson, 1972, Adsorption (of Organic Chemicals by Soils), in: Organic Chemicals in the Soil Environment, Goring, Cai & Hanmaker, Editors, Marcel Dekker, New York City, New York, 1:49-144.

177

Hardin, B.D., R.L. Schuler, and J.R. Burg, 1987. Evaluation of 60 chemicals in a preliminary developmental toxicity test. Teratogenesis Carcinogen Mutagen 7:29-48.

Harleman, J.H. and W. Seinen, 1979, Short-term toxicity and reproduction studies in rats with hexachloro-(1,3)-butadiene . Toxicol Appl Pharmacol 47: 1-14.

Haseltine, S.D., M.T. Finley, and E. Cromartie, 1980, Reproduction and residue accumulation in Black Ducks fed Toxaphene, Arch. Envion. Contam. Toxicol. 9:461-471.

Haut, K.T., K.E. Stebbins, and K.A. Johnson, 1996, Subchronic toxicity of ingested 1,3-dichloropropene in rats and mice. Fundam Appl Toxicol 32:224-232.

Hayes, J.R., L.W. Condie, Jr., and J.L. Egle, Jr., 1987. The acute and subchronic toxicity in rats of trans- 1,2-dichloroethylene in drinking water. J Am Co11 Toxicol 6:471-478.

Hazleton, 1987, Vinyl acetate: Oral (drinking water) 2 generation reproduction study in rat with attachments and cover letter date 05/23/88.U.S. EPA/OTS public files. Hazleton Labs Europe Ltd. Document no. 8EHQ-0588-0642.

Hazleton, 1988, Vinyl acetate: 104-week oral (drinking water) combined chronic toxicity & carcinogenicity studies in the rat following in-utero exposure (Volume I, II, III) with cover letter 05/23/88. U.S. EPA/OTS public files. Hazleton Labs Europe Ltd. Document no. 86-880000265.

Hazleton, 1989, Subchronic toxicity study in rats with paranitrophenol (HLA, study no. 241-221). Sponsored by Monsanto Co., St. Louis, Missouri. NTIS/GTS0526338.

Heindel, J.J., D.K. Gulati, and R.C. Mounce, 1989, Reproductive toxicity of three phthalic acid esters in a continuous breeding protocol. Fundam Appl Toxicol 12:508-518.

HEW, 1979, Bioassay of Phthalic anhydride for Possible Carcinogenicity p.v (1979) Technical Rpt Series No. 159 DHEW Pub No. (NIH) 79-1715.

Higley, K. and R. Kuperman, 1995, Radiological Benchmarks for Wildlife at Rocky Flats Environmental Technology Site, Golden, Colorado, March.

Hoechst Aktiengesellschaft, 1984, MRID No. 00151908. Available from EPA. Write to FOI, EPA, Washington, D.C. 20460.

Hong, C.B., H.V. Ellis, C.C. Lee, H. Sprinz, J.C. Dacre, and J.P. Glennon, 1985, Subchronic and chronic toxicity studies of 2,4-dinitrotoluene. Part III: CD-1 Mice. J. Am. College Toxicol. 4(4): 257-269.

Hutzler, N.J., J.C. Crittenden, J.L. Oravitz, and P.A. Schaepe, 1983, Groundwater Transport of Chlorinated Organic Compounds, Amer. Chem. Soc. 186th Natl. Mtg. Div. Environ. Chem. Preprints, 23:499-502.

198

IITRI (IIT Research Institute), 1995, 90-Day oral gavage toxicity study of 1,3,5-trimethylbenzene in rats with a recovery group. Conducted for Koch Industries Inc., Wichita Kansas.

Industry Task Force on MCPA Research Data (as citied in IRIS), 1986, MRID No. 40041701. Available from EPA. Write to FOI, EPA, Washington, D.C., 20460.

Ito, N., H. Nagasaki, M. Arai, S. Sugihara, and S. Makiua, 1973, Histologic and ultrastructural studies on the hepatocarcinogenicity of benzene hexachloride. J. Natl. Cancer Inst. 51(3): 817-826.

Jiang, Q.G., J.G. Sun, and X.F. Qin, 1991, The effects of trinitrotoluene toxicity on zinc and copper metabolism. Toxicol Lett 55(3):343-349.

Jones-Price, C., R. Wolkowski-Tyl, and M.C. Marr, 1984, Teratologic evaluation of carbon disulfide (CAS No. 75-15-0) administered to CD rats on gestational days 6 through 15. Research Triangle Park, NC: National Center for Toxicological Research, Division of Teratogenesis Research. NCTR 222-80-2031(C); NTIS PB84-0192343.

Jones-Price, C., T.A. Ledoux, and J.R. Reel, 1983, Teratologic evaluation of phenol (CAS No. 108-95-2) in CD mice. Laboratory study: September 18, 1980 to January 12, 1981. Research Triangle Park, North Carolina: Research Triangle Institute.

Karickhoff, S.W., 1981, Semi-Empirical Estimation of Sorption of Hydrophobic Pollutants on Natural Sediments and Soils, Chemosphere, 10:833-46.

Kavlock, R.J., R.D. Short, Jr., and N. Chemoff, 1987, Further evaluation of an in vivo teratology screen. Teratogenesis Carcinog Mutagen 7:7- 16.

Kelce W., C. Lambright, and E. Gray, 1997, Vinclozolin and p,p'-DDE alter androgen-dependent gene expression: In vivo confirmation of an androgen receptor-mediated mechanism. Toxicol Appl Pharmacol 142:192-200.

Kelce, W., C. Stone, and S. Laws, 1995, Persistent DDT metabolite p,p'-DDE is a potent androgen receptor antagonist. Nature 375:581-585.

Khera, K.S. and D.C. Villenueve, 1975, Teratogenicity studies on halogenated benzenes (pentachloro-, pentachlorinitro-, and hexabromo-) in rats. Toxicology, 5: 117-122.

Kimmerle, G. and O.R. Klimmer, 1974, Acute and subchronic toxicity of Sulfotep. Arch. Toxicol. 33(1): 1-16.

Kirk, H.D., T.R. Hanley, Jr., and D.M. Bond, 1990, Propylene dichloride: Two-generation reproduction study in Sprague-Dawley rats. Mammalian and Environmental Toxicology Research Laboratory, Health and Environmental Sciences, The Dow Chemical Company, Midland, Michigan.

179

Kirk, H.D., T.R. Hanley, and K.A. Johnson, 1989, Propylene dichloride: Oral teratology study in Sprague-Dawley rats. Dow Chemical Company, Mammalian and Environmental Toxicology Research Laboratory, Midland, Michigan.

Klaunig, J.E., R.J.Ruth, and M.A. Pereira, 1986, Carcinogenicity of chlorinated methane and ethane compounds administered in drinking water to mice. Environmental Health Perspectives 69:89-95.

Koch, R., 1983, Molecular Connectivity Index for Assessing Ecotoxicological Behaviour of Organic Compounds, Toxical. Environ. Chem., 6:87-96.

Kociba, R.J., S.B. McCollister, C. Park, T.R. Torkelson, and P.J. Gehring, 1974, 1,4-Dioxane. I. Results of a 2-year ingestion study in rats. Toxicol. Appl. Pharmacol. 30: 275-286.

Kociba, R.J., D.G. Keyes, and G.C. Jersey, 1977a, Results of a two year chronic toxicity study with hexachlorobutadiene in rats. Am Ind Hyg Assoc J 38589-602.

Kociba, R.J., B.A. Schwetz, and D.G. Keyes, 1977b, Chronic toxicity and reproduction studies of hexachlorobutadiene in rats. Environ Health Perspect 21:49-53.

Kociba, R.J., D.G. Keyes, and R.W. Lisowe, 1979, Results of a two-year chronic toxicity and oncogenic study of rats ingesting diets containing 2,4,5- trichlorophenoxyacetic acid (2,4,5-T). Food Cosmet. Toxicol. 17: 205-221.

Koplin, J.R., M.W. Collopy, and A.R. Bammann, 1980, Energetics of Two Wintering Raptors, Auk, 97:795-806.

Kufeld, R.C., O.C. Wallmo, and C. Feddema, 1973, Foods of the Rocky Mountain Mule Deer, Research Paper, RM-111:1-31, USDA Forest Service.

Lane, R.W., G.S. Simon, R.W. Dougherty, J.L. Egle, and J.F. Borzelleca, 1985, Reproductive toxicity and lack of dominant lethal effects of 2,4- dinitrotoluene in the male rat. Drug Chem. Toxicol. 8(4): 265-280.

Lee, C.C., H.V. Ellis, and J.J. Kowalski, 1976, Mammalian toxicity of munitions compounds. Phase II: Effects of multiple doses. Part IIh 2,6-Dinitrotoluene. Progress report no. 4. Midwest Research Institute Project no. 3900-B. Contract no. DAMD-17-74-C-4073, Kansas City, Missouri.

Lee, C.C., H.V. Ellis, and J.J. Kowalski, 1978, Mammalian toxicity of munitions compounds. Phase II: Effects of multiple doses. Part II: 2,4-Dinitrotoluene. Progress report no. 3. Midwest Research Institute, Contract no. DAMD-17-74-C-4073, Kansas City, Missouri.

Lee, C.C., C.B. Hong, H.V. Ellis, J.C. Dacre, and J.P. Glennon, 1985, Subchronic and chronic toxicity studies of 2,4-dinitrotoluene. Part II: CD Rats. J. Am. College Toxicol. 4(4): 243-256, Kansas City, Missouri.

Lijinsky, W. and H.W. Taylor, 1979, Carcinogenicity of methylated derivatives of N-nitrosodiethylamine and related compounds in Sprague-Dawley rats. J. Natl. Cancer Inst. 62(2): 407-410.

Lijinsky, W. and M.D. Reuber, 1983, Carcinogenesis in Fischer rats by nitrosodipropylamine, nitrosodibutylamine and nitrosobis(2-oxopropyl)amine given by gavage. Cancer Lett. 19: 207-213.

Linder, R., T. Scotti, J. Goldstein, K. McElroy, and D. Walsh, 1980, Acute and subchronic toxicity of pentachlorobenzene. J. Environ. Pathol. Toxicol. 4: 183-196.

Loeffler, I.K. and R.E. Peterson, 1999, Interactive effects of TCDD and p,p'-DDE on male reproductive tractdevelopment in in utero and lactationally exposed rats. Toxicol Appl Pharmacol 154:28-39.

Long, E.R., D.D. MacDonald, L.S. Smith, and F.D. Calder, 1995, Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments, Env. Manag. 19(1)81-97.

MacDonald, D.D., T. Berger, K. Wood, J. Brown, T. Johnsen, M.L. Haines, K. Brydges, M.J. MacDonald, S.L. Smith, and P. Shaw, 1999, A Compendium of Environmental Quality Benchmarks for Priority Substances in the Georgia Basin, Volume II, Water Quality Benchmarks, Prepared by MacDonald Environmental Sciences Ltd., Nanaimo, British Columbia, for Environment Canada, North Vancouver, British Columbia.

MacDonald, D.D., C.G. Ingersoll, and T.A. Berger, 2000a, "Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems," *Arch. Environ. Contam. Toxicol.*, 39:20-31.

MacDonald, D.D., L.M. DiPinto, J. Field, C.G. Ingersoll, E.R. Long, and R.C. Schwartz, 2000b, "Development and evaluation of consensus-based sediment effect concentrations for polychlorinated biphenyls." *Environ Tox and Chem.*, 19(5):1403-1413.

Maltoni, C., A. Ciliberti, C. Pinto, M. Soffritti, F. Belpoggi, and L. Menarini, 1997, Results of longterm experimental carcinogenicity studies of the effects of gasoline, correlated fuels, and major gasoline aromatics on rats. Ann. New York Acad. Sci. 837: 15-52.

Mann, A.H., S.C. Price, and F.E. Mitchell, 1985, Comparison of the short-term effects of di(2-ethylhexyl) phthalate, di(n-hexyl)phthalate, and di(n-octyl)phthalate in rats. Toxicol Appl Pharmacol 77:116-132.

Matuk, Y., M. Ghosh, and C. McCulloch, 1981, Distribution of silver plasma proteins of the albino rat. Can J Ophthalmol 16:145-150.

McCauley, P.T., M. Robinson, and L.W. Condie, 1990. The effect of subacute and subchronic oral exposure to cis- 1,2-dichloroethylene in rats. Cincinnati OH: U.S.

Environmental Protection Agency, Health Effects Research Laboratory, and Air Force Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio.

McCollister, D.D., D.T. Lockwood, and V.K. Rowe, 1961, Toxicologic information on 2,4,5-trichlorophenol. Toxicol. Appl. Pharmacol. 3: 63-70.

MIDEQ, 2003, Michigan Department of Environmental Quality, Rule 57 Water Quality Values, February.

Miñana, M.D., G. Marcaida, and S. Grisolia, 1985, Prenatal exposure of rats to ammonia impairs NMDA receptor function and affords delayed protection against ammonia toxicity and glutamate neurotoxicity. J Neuropathol Exp Neurol 54(5):644-650.

Mistsumori, K., T. Usui, K. Takahashi, and Y. Shirasu,, 1979, Twenty-four month chronic toxicity studies of dichlorodiisopropyl ether in mice. Nippon NoYaku Gakkaishi. 4(3): 323-335.

MOEE, 1996, Guidelines for Use at Contaminated Sites, Ontario Ministry of Environment and Energy.

Monsanto Co., 1980, A teratogenicity study with p-nitroaniline in rats. Unpublished study produced May 13, 1980 by Bio/dynamics, Inc. Submitted January 18, 1983 to U.S. EPA under TSCA Section.

Monsanto Co., 1985, Teratology study in rats with o-nitroaniline. Unpublished study produced 11/26/85 and submitted (no date) to U.S. EPA under TSCA Section 4. EPA Doc. No. 40-8576371. Fiche No. OTS0516867. TSCATS 311920.

Morrison, P. and F.A. Ryser, 1962, "Metabolism and Body Temperature in Small Hibernator, the Meadow Jumping Mouse," Zapus hundsonius, Journal Cell Physiology, 60:169-180.

Morrissey, R.E., J.C. Lamb, and R.W. Morris, 1989, Results and evaluations of 48 continuous breeding reproduction studies conducted in mice. Fundam Appl Toxicol 13:747-777.

Murata, Y., A. Denda, and H. Maruyama, 1993, Chronic toxicity and carcinogenicity studies of 1-methylnaphthalene in B6C3F1 mice. Fundam Appl Toxicol 21:44-51.

Murata, Y., A. Denda, and H. Maruyama, 1997, Short communication. Chronic toxicity and carcinogenicity studies of 2-methylnaphthalene in B6C3F1 mice. Fundam Appl Toxicol 36:90-93.

Murray, F.J., J.A. John, and M.F. Balmer, 1978, Teratologic evaluation of styrene given to rats and rabbits by inhalation or by gavage. Toxicology 11:335-343.

Nagy, K. A., 1987, Field metabolic rate and food requirement scaling in mammals and birds. Ecol. Monogr. 57: 111-128.

Nair, R.S., C.S. Auletta, R.E. Schroeder, and F.R. Johannsen, 1990, Chronic toxicity, oncogenic potential, and reproductive toxicity of p-nitroaniline in rats. Fund. Appl. Toxicol. 15: 607-621.

Narotsky, M.G. and R.J. Kavlock, 1995, A multidisciplinary approach to toxicological screening: II, Developmental toxicity. J Toxicol Environ Health 45: 145-171.

NCI, 1977, Bioassay of 1,1-dichloroethane for possible carcinogenicity. Bethesda, Maryland: National Cancer Institute. NIH publication No. 78-1316.

NCI, 1978a, Bioassay of Hexachloroethane for Possible Carcinogenicity. CAS No. 67-72-1. NCI-CG-TR-68. Tech. Report Ser. No. 68. U.S. DHEW. Publ. No. (NIH) 78-1318.

NCI,, 1978b, Bioassay of 1,4-Dioxane for Possible Carcinogenicity, CAS No. 123-91-1. NCI Carcinogenesis Tech. Rep. Ser. No. 80. DHEW Publication No. (NIH) PB-285-711.

NCI, 1978c, Bioassays of DDT, TDE, and p,p'-DDE for possible carcinogenicity. CAS No. 50-29-3, 72-54-8, 72-55-9 NCI-CG-TR-131. NCI Report No. 131. DHEW Publ. No. (NIH) 78-1386.

NCI, 1978d, Bioassay of 1 ,1,2,2-tetrachloroethane for possible carcinogenicity. NTIS PB277 4537GA, DHEW/PUB/NIH-78-827, 90.

NCI, 1978e, Bioassay of trichlorofluoromethane for possible carcinogenicity. Report No. 106, PHS/NIH, DWEH, Publ. No. 78- 1356.

NCI, 1979a, Bioassay of N-Nitrosodiphenylamine for Possible Carcinogenicity. NCI Carcinogenesis Technical Report Series No. 164. NIH 79-1720. NTIS PB 298-275.

NCI, 1979b, Bioassay of p-chloroaniline for possible carcinogenicity. NCI Carcinogenesis Tech. Rep. Ser. No. 189. NTIS PB 295896.

NOAA, 1999, Screening Quick Reference Tables (SQuiRTs), National Oceanic and Atmospheric Association; available at www.noaa.gov.

Nor-Am Agricultural Products, Inc. (as citied in IRIS), 1972, MRID No. 00123976. Available from EPA. Write to FOI, EPA, Washington, D.C. 20460.

NTP, 1978, Bioassay of hexachloroethane for possible carcinogenicity. CAS No. 67-72-1. NCI-CG-TR-68. Tech. Report Ser. No. 68. U.S. DHEW. Publ. No. (NIH) 78-1318.

NTP, 1983a, 120-Day gavage study in mice and rats with 1,2,3-trichloropropane. Unpublished report prepared by Hazleton Laboratories.

NTP, 1983b, Carcinogenesis studies of 1,1,1,2- tetrachloroethane in F344/N rats and B6C3F1 mice. NTP, Washington, D.C.

NTP, 1985a, Twenty-six-week subchronic study and modified mating trial in F344 rats. Butyl benzyl phthalate: Final Report. Project No. 12307-02, -03. Hazelton Laboratories America, Inc. Unpublished study.

NTP, 1985b, Toxicology and carcinogenesis studies of chlorobenzene (CAS No. 108-90-70) in F344/N rats and B6C3F mice (gavage studies). Technical report series No. 261. Research Triangle Park, NC: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Toxicology Program. NIH Publication No. 86-2517.

NTP, 1985c, Toxicology and carcinogenesis studies of Telone II (technical grade 1,3-dichloropropene containing 1% epichlorohydrin as a stabilizer) in F344/N rats and B6C3F1 mice (gavage studies). U.S. Dept. of Health and Human Services, Technical Report Series No. 269.

NTP, 1985d, Di-n-octylphthalate: Reproduction and fertility assessment in CD-l mice when administered in feed. Research Triangle Park, North Carolina: National Institute of Environmental Health Sciences, National Toxicology Program. NTP-85-140. NTIS Order No. PB85-218147.

NTP, 1986a, Toxicology and carcinogenesis studies of 1,2-dichloropropane (propylene dichloride) in F344/N rats and B6C3Fl mice (gavage studies). Technical Report-No. 263.

NTP, 1986b, Technical report series no. 291. Toxicology and carcinogenesis studies of isophorone (CAS No. 78-59-l) in F344/N rats and B6C3Fl mice (gavage studies). Research Triangle Park, North Carolina: U.S. Department of Health and Human Services. Public Health Service, National Institutes of Health, NIH publication no. 86-2547.

NTP, 1987, Toxicology and carcinogenesis studies of 1,4-Dichlorobenzene (CAS No. 106-46-7) in F344/N rats and B6C3Fl mice (gavage studies). Research Triangle Park, North Carolina: National Toxicology Program. NTP TR 319. NIH Publication No. 87-2575.

NTP, 1989a, Toxicology and carcinogenesis studies of hexachloroethane (CAS No. 67-72-l) in F344/N rats (gavage studies). Research Triangle Park, North Carolina: U.S. Department of Health and Human Services. National Institutes of Health. NTP TR 361. NIH Publication No. 89-2816.

NTP, 1989b, National Toxicology Program- technical report series no. 353. Toxicology and carcinogenesis studies of 2,4-dichlorophenol in F344/N rats and B6C3Fl mice (feed studies). U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health. Research Triangle Park, North Carolina.

NTP, 1991, Toxicity studies of hexachloro-1,3-butadiene in B6C3F1 mice (feed studies). Research Triangle Park, North Carolina: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health. NIH publication no. 91-3120.

NTP, 1993, Toxicology and carcinogenesis studies of p-nitroaniline (CAS No. 100-01-6) in B6C3F1 mice (gavage studies). NTP TR 418. NIH Publication No. 93- 3149.

NTP, 2001, Toxicology and carcinogenesis studies of p-nitrotoluene (CAS No. 99-99-0) in F344/N rats andB6C3F1 mice (feed studies). NTP TR 498. NIH Publication No. 01-4432.

NY State Department of Environmental Quality, 1998, Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, New York State Department of Environmental Quality, June.

Olin Mathieson Chemical Corporation (as citied in IRIS), 1968a, MRID No. 00001667, 00083328, 00114201; HED Doc. No. 005188. Available from EPA. Write to FOI, EPA, Washington, D.C. 20460.

Olin Mathieson Chemical Corporation (as citied in IRIS), 1968b, MRID No. 00001666; HED Doc. No. 000654. Available from EPA. Write to FOI, EPA, Washington, D.C. 20460. (3 generational rat study).

ORNL, 1998, Empirical Models for the Uptake of Inorganic Chemicals from Soil by Plants, Bechtel Jacobs Company L.L.C., Oak Ridge, Tennessee, BJC/OR-133.

Plasterer, M.R., W.S. Bradshaw, and G.M. Booth, 1985, Developmental toxicity of nine selected compounds following prenatal exposure in the mouse: napthalene, p-nitrophenol, sodium selenite, dimethyl phthalate, ethylenethiourea, and four glycol ether derivatives. J Toxicol Environ Health 15:25-38.

Peon, R., P. Lecavalier, and R. Mueller, 1995, Subchronic oral toxicity of di-n-octylphthalate and di(2-ethylhexyl)phthalate in the rat. (ATSDR peer-reviewed draft).

PRC, 1994, Draft Technical Memorandum: Development of Toxicity Reference Values, as Part of a Regional Approach for Conducting Ecological Risk Assessment at Naval Facilities in California, PRC Environmental Management, Inc., Prepared for the U.S. Department of Navy.

Rao, P.S.C. and J.M. Davidson, 1982, Retention and Transformation of Selected Pesticides and Phosphorus in Soil-Water Systems: A Critical Review, EPA-600/S3-82-060, Athens, Georgia, EPA.

Research Triangle Institute, 1986, Teratologic evaluation of 2,3,4,6- tetrachlorophenol (CAS No. 58-90-2) administered to CD rats on gestational days 6 through 15. Chemistry and Life Sciences, RTI, Research Triangle Park, North Carolina.

Rhodia, Inc. (as citied in IRIS), 1969, MRID 0092165. Available from EPA. Write to FOI, EPA, Washington, D.C., 20460.

Ritsema, R., W.P. Cofino, P.C.M. Frintop, and U.A. Brinkman, 1989, Trace-Level Analysis of Phthalate Esters in Surface Water and Suspended Particulate Matter by Means of Capillary Gas Chromatography with Electron-Capture and Mass-Selective Detection, Chemosphere, 18:2161-75.

185

Robinson, K.S., R.J. Kavlock, N. Chernoff, and E. Gray, 1981, Multi- generation study of 1,2,4-trichlorobenzene in rats. J. Toxicol. Environ. Health. 8: 489-500.

Robinson, M., R.H. Bruner, and G.R. Olson, 1990, Fourteen- and ninety-day oral toxicity studies of methyl tertiary-butyl ether in Sprague-Dawley rats. Health Effects Research Lab, U.S. Environmental Protection Agency, Cincinnati. J Am Coll Toxicol 9(ISS 5):525-540.

Rodwell, D.E., R.D. Wilson, and M.D. Nemec, 1989, Teratogenic assessment of 2,4-dichlorophenol in Fischer 344 rats. Fundam Appl Pharmacol 13:635-640.

Ruddick, J.A., Villeneuve D.C., and I. Chu, 1983. A teratological assessment of four trihalomethanes in the rat. J Environ Sci Health B18:333-349.

Rungby, J., L. Slomianka, and G. Danscher, 1987, A quantitative evaluation of the neurotoxic effect of silver on the volumes of developing rat hippocampus. Toxicology 43:261-268.

Russell, D.J. and B. McDuffie, 1986, Chemodynamic Properties of Phthalate Esters: Partitioning and Soil Migration, Chemosphere, 15:1003-21.

Sabljic, A. and M. Protic, 1982, Relationship Between Molecular Connectivity Indices and Soil Sorption Coefficients of Polycyclic Aromatic Hydrocarbons, Bull. Environ. Contam. Toxicol., 28:162-5.

Sample, B.E., D.M. Opresko, and G.W. Suter, II, 1996, Toxicological Benchmarks for Wildlife, 1996 Revision, Prepared for the DOE, Oak Ridge National Laboratory, ES/ER/TM-86/R3, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Sample, B.E., J. Beauchamp, R. Efroymson, G. W. Suter, II, and T.L. Ashwood, 1998a, Development and Validation of Bioaccumulation Models for Earthworms, ES/ER/TM-220. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Sample, B.E., J. Beauchamp, R. Efroymson, and G.W. Suter, II, 1998b, Development and Validation of Bioaccumulation Models for Small Mammals, ES/ER/TM-219, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Schröter, C., W. Parzefall, and H. Schröter, 1987, Dose-response studies on the effects of α-, β-, and γ-hexachlorocyclohexane on putative preneoplastic foci, monooxygenases, and growth in rat liver. Cancer Res 47:80-88.

Schulte-Hermann, R. and W. Parzefall, 1981, Failure to determine initiation from promotion of liver tumors in a long-term study with the phenobarbital- type inducer alpha-hexachlorocyclohexane and the role of sustained stimulation of hepatic growth and monooxygenases. Cancer Res. 41: 4140-4146.

Schwetz, B.A., J. Norris, R. Kociba, P.A.. Keeler, R.F. Cornier, and P.J. Gehring. 1974. Reproduction Study of Japanese Quail Fed Hexachlorobutadiene for 90 Days. Toxicol Appl Pharmacol 30:255-265.

Schwetz, B.A., F.A. Smith, and C.G. Humiston, 1977, Results of a reproduction study in rats fed diets containing hexachlorobutadiene. Toxicol Appl Pharmacol 42: 387-398.

Seidenberg, J.M., D.G. Anderson, and R.A. Becker, 1986, Validation of an in vivo developmental toxicity screen in the mouse. Teratogenesis Carcinogen Mutagen 6:361-374.

Seip, H.M., J. Alstad, G.E. Carlberg, K. Martinsen, and R. Skaane, 1986, Measurement of Mobility of Organic Compounds in Soils, Sci. Total Environ., 50:87-101.

Seyler, D.E., J.M. East, and L.W. Condie, 1984, The use of in vitro methods for assessing reproductive toxicity: Dichlorophenols. Toxicol Lett 20:309-315.

Sherman, H, 1974, Long-term feeding studies in rats and dogs with dichlorodifluoromethane (Freon 12 Food Freezant). Haskell Laboratory for Toxicology and Industrial Medicine Report No. 24-74.

Shimizu, M., T. Noda, and T. Yamano, 1992, Safety evaluation of chemicals for use in household products (XVII). A teratological study on hexachloroethane in rats. Osaka City Institute of Public Health and Environmental Sciences 54:70-75 (Japanese [translation in progress]).

Shopp, G.M., Jr., V.M. Sanders, and K.L. White, Jr., 1985, Humoral and cell-mediated immune status of mice exposed to trans-1,2-dichloroethylene. Drug Chem Toxicol 8:393-407.

Simon, G.S., R.G. Tardiff, and J.F. Borzelleca, 1979, Failure of hexachlorobenzene to induce dominant lethal mutations in the rat. Toxicol Appl Pharmacol 47:415-419.

Smith, F.A., F.J. Murray, and J.A. John, 1981, Three-generation reproduction study of rats ingesting 2,4,5-trichloropenoxyacetic acid in the diet. Toxicol. Res. Lab., Dow Chemical, Midland, Michigan.

Southworth, G.R., and Keller, J.L., 1986, Hydrophobic Sorption of Polar Organics by Low Organic Carbon Soils, Water Air Soil Poll., 28:236-48.

Spencer, H.C., V.K. Rowe, and E.M. Adams, 1948, Toxicological studies on laboratory animals of certain alkyldinitrophenols used in agriculture. J Ind Hygiene Toxicol 30:10-25.

SRC, 1988, Syracuse Research Corporation Calculated Values.

Srivastava, S., P.K. Seth, and S.P Srivastava, 1989, Effect of styrene administration on rat testis. Arch Toxicol 63:43-46.

Stula, E.F., H. Sherman, J.A. Zapp, and J.W. Clayton, 1975, Experimental neoplasia in rats from oral administration of 3,3'-dichlorobenzidine, 4,4'- methylene-bis(2- chloroanaline), and 4,4'-methylene-bis(2-methylanaline). Toxicol. Appl. Pharmacol. 31: 159-176.

Suter, G.W. and C.L. Tsao, 1996, Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effect on Aquatic Biota, 1996 Revision, ES/ER/TM-96/R2.

Szabo, G., S.L. Prosser, and R.A. Bulman, 1990, Determination of the Adsorption Coefficient (Koc) of Some Aromatics for Soil by RP-HPLC on Two Immobilized Humic Acid Phases, Chemosphere, 21:777-88.

Tainter, M.L., 1938, Growth, life-span, and food intake of white rats fed dinitrophenol throughout life. J Pharmacol Exp Ther 63:51-57.

Thomas, J.O., R.H. Wilson, and C.W. Eddy, 1940, Effects of continued feeding of diphenylene oxide. Food Res. 5: 23-30.

Tryphonas, L. and F. Iverson, 1983, Sequential histopathologic analysis of α-hexachloro-hexane-induced hepatic megalocytosis and adenoma formation in the HPB mouse. JNCI 71:1307-1318.

Tsuda, H., A Haziware, M. Shibata, M. Ohsima, and N. Ito, 1982, Carcinogenic Effect of Carbazole in the Liver of (C57BL/6N x C3G/HEN)F1 Mice. J. Natl. Cancer Inst. 69:1383-1389.

University of Michigan, 2004, Animal Diversity Web: http://animaldiversity.ummz.umich.edu/site/accounts/information/Cynomys_ludovicianus.html.

U.S.FWS. 1984. Handbook of Toxicity of Pesticides to Wildlife. Resource Publication 153. Washington, DC: U.S. Government Printing Office, 32

Velsicol Chemical Corporation (as citied in IRIS), 1966, MRID No. 00028249. Available from EPA. Write to FOI, EPA, Washington, D.C., 20460.

Velsicol Chemical Corporation (as citied in IRIS), 1973, MRID No. 00062678. Available from EPA. Write to FOI, EPA, Washington, D.C., 20460.

Velsicol Chemical Corporation (as citied in IRIS), 1978, MRID No. 00028236. Available from EPA. Write to FOI, EPA, Washington, D.C., 20460.

Velsicol Chemical Corporation (as citied in IRIS), 1981, MRID No. 00084024. Available from EPA. Write to FOI, EPA, Washington, D.C., 20460.

Velsicol Chemical Corporation (as citied in IRIS), 1985, MRID No. 00125333. Available from EPA. Write to FOI, EPA, Washington, D.C., 20460.

188

Vos, J.G., H.L. Van der Maas, A. Musch, and E. Ram. 1971. Toxicity of Hexachlorobenzene in Japanese Quail with Special Reference to porphyria, Liver Damage, Reproduction, and Tissue Residues. Toxicol. Appl. Pharmacol. 18, 944-957.

Vowles, P.D. and R.F.C. Mantoura, 1987, Sediment-Water Partition Coefficients and HPLC Retention Factors of Aromatic Hydrocarbons, Chemosphere, 16:109-16.

Weeks, M.H., R.A. Angerhofer, R. Bishop, J. Thomasino, and C.R. Pope, 1979, The toxicity of hexachloroethane in laboratory animals. Am. Ind. Hyg. Assoc. J. 40: 187-198.

Weisburger, E.K., B.M. Ulland, J. Nam, J.J. Gart, and J.H. Weisburger, 1981, Carcinogenicity tests of certain environmental and industrial chemicals. Journal National Cancer Institute 67:75-88.

Whitaker, J.O., Jr., 1972, Zapus hudsonius, Mammalian Species, 11:1-7.

Wolf, M.A., V.K. Rowe, D.D. McCollister, R.L. Hollingsworth, and F. Oyen, 1956, Toxicological studies of certain alkylated benzenes and benzene. Arch. Ind. Health. 14: 387-398.

Yang, R.S., K.M. Abdo, and M.R. Elwell, 1989, Subchronic toxicology studies of hexachloro-1,3-butadiene (HCBD) in B6C3F1 mice by dietary incorporation. JEPTO 9:323-332.

You, L., M. Casanova, and S. Archibeque-Engle, 1998, Impaired male sexual development in perinatal Sprague-Dawley and Long-Evans hooded rats exposed in utero and lactationally to p,p'-DDE. Toxicol Sci 45:162-173.

189

TABLES

190

161

Table B-1
Receptor-Specific Input Parameters Used in ESL Calculations

Receptor	Body Weight (kg)	Body Weight Reference	Percentage of Diet: Plant Tissue	Percentage of Diet: Invertebrate Tissue	Percentage of Diet: Bird or Mammal Tissue	Dietary Reference	Ingestion Rate (kg/kg BW day^{-1})	Ingestion Rate Reference	Percentage of Diet as Soil	Soil Ingestion Reference
Vertebrate Receptors										
PMJM	0.019	Morrison and Ryser (1962)	70	30	0	Estimated from Whitacker (1972)	0.17	EPA (1993) - Estimated-Nagy (1987) - Rodent Model	2.4	Beyer et al. (1994) - Meadow Vole used as a conservative surrogate
Deer Mouse - Insectivore	0.0187	Flake (1973)	0	100	0	Generalized Diet	0.065	Cronin and Bradley (1988)	2	Beyer et al. (1994)
Deer Mouse - Herbivore	0.0187	Flake (1973)	100	0	0	Generalized Diet	0.111	Cronin and Bradley (1988)	2	Beyer et al. (1994)
Prairie Dog	1.14	University of Michigan (2004) - Online	100	0	0	Generalized Diet	0.029	EPA (1993) - Estimated-Nagy (1987) - Rodent Model	7.7	Beyer et al. (1994)
Coyote - Generalist	12.75	Bekoff (1977) - Average of male and female weights	0	25	75	Generalized Diet	0.015	Gier (1975)	5	Beyer et al. (1994) - High end estimate for Red Fox
Coyote - Insectivore	12.75	Bekoff (1977) - Average of male and female weights	0	100	0	Generalized Diet	0.015	Gier (1975)	2.8	Beyer et al. (1994) - Red Fox
Coyote - Carnivore	12.75	Bekoff (1977) - Average of male and female weights	0	0	100	Generalized Diet	0.015	Gier (1975)	2.8	Beyer et al. (1994) - Red Fox
Mule Deer	67	Anderson et al. (1974) - Average of male and female weights.	100	0	0	Kufeld et al. (1973)	0.022	Aldredge et al. (1974)	1.7	Beyer et al. (1994) - High end estimate
Mourning Dove - Herbivore	0.113	Average of adult values from CalEPA (2004) Online Database	100	0	0	Cowan (1952)	0.23	EPA (2003a)	9.3	Beyer et al (1994) - Wild turkey used as a surrogate.
Mourning Dove - Insectivore	0.113	Average of adult values from CalEPA (2004) Online Database	0	100	0	Generalized Diet	0.23	EPA (2003a)	9.3	Beyer et al (1994) - Wild turkey used as a surrogate.
American Kestrel	0.116	Brown and Amadon (1968) - Average value	0	20	80	Generalized Diet from several studies presented in the Watershed ERA DOE (1996)	0.092	Kolpin et al. (1980)	5	Assumed value based on conservative estimates for carnivores

192

Table B-1
Receptor-Specific Input Parameters Used in ESL Calculations

Receptor	Body Weight (kg)	Body Weight Reference	Percentage of Diet: Plant Tissue	Invertebrate Tissue	Bird or Mammal Tissue	Dietary Reference	Ingestion Rate (kg/kg BW day^{-1})	Ingestion Rate Reference	Percentage of Diet as Soil	Soil Ingestion Reference
Non-Wildlife Terrestrial Receptors										
Terrestrial Invertebrates	NA									
Terrestrial Plants	NA									
Aquatic Receptors										
Sediment Dwelling Aquatic Macroinvertebrates	NA									
General Aquatic Life	NA									

NOTES:
Receptor parameters for all receptors with the exception of the Prairie Dog and the Mourning Dove were taken from the Watershed Risk Assessment (DOE, 1996b) and referenced to the original source.
All receptor parameters are estimates of central tendency except where noted.
All values are presented in a dry weight basis.

193

Table B-2
TRVs for Terrestrial Vertebrate Receptors

ECOI	NOAEL (mg/kg day)	NOAEL Endpoint	Lowest Bounded LOAEL (mg/kg day)	LOAEL Endpoint	TRV Source	Uncertainty Factor	Final NOAEL (mg/kg day)	Threshold (mg/kg day)	Rationale For Calculation	TRV Confidence	Confidence Notes
Mammal											
Acenaphthene	700	No effects on Mouse Survival	NA	NA	Attachment 3	NA	NA	NA	No effects at highest dose	NA	Only 1 study was available for 1 species with a mortality endpoint. The data are inadequate to calculate a final TRV.
Acetone	10	No increase in rat liver or kidney weight	50	Kidney effects	Sample et al. (1996)	1	10	22.36	The nature of the effect is not likely to cause a significant effect on growth, reproduction or survival. Thus, the data satisfy the requirements described in the text for calculating a threshold.	High	
Aldrin[1]	0.1	Estimated from LOAEL	1	Reduced learning and cognitive ability in rats	PRC (1994)	1	0.1	NA	NOAEL was estimated from LOAEL	High	
Ammonium (as Ammonia)	9658	No changes in reproduction or development	NA	NA	Attachment 3	10	965.8	NA	No effects noted at the highest dose level.	Moderate	
Anthracene	1000	No effects on mouse mortality.	NA	NA	Attachment 3	NA	NA	NA	No effects were predicted at the highest dose level.	NA	Only 1 study was available for 1 species with a mortality endpoint. The data are inadequate to calculate a final TRV.
Antimony	0.06	No change to rat progeny weight	0.59	Decrease in rat progeny weight	EPA (2003)	1	0.06	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	Very High	
Arsenic	0.32	No change in rat growth or survival	4.7	Decrease in rat water intake and kidney weight in relation to body weight.	PRC (1994)	1	0.32	1.23	The nature of the effect is not likely to cause a significant effect on growth, reproduction or survival. Thus, the data satisfy the requirements described in the text for calculating a threshold.	High	
Aroclor 1016	See PCB (total)										
Aroclor 1221	See PCB (total)										
Aroclor 1232	See PCB (total)										
Aroclor 1242	See PCB (total)										
Aroclor 1248	See PCB (total)										
Aroclor 1254	See PCB (total)										
Aroclor 1260	See PCB (total)										
Barium	51.8	Mean value	121	Decrease in rat growth and reproduction	USEPA (2003)	1	51.8	NA	No threshold value calculated due to multiple endpoints affected at the LOAEL	Very High	
Benzene	26.36	NOAEL estimated from LOAEL	263.6	Maternal mortality and embryonic resorption in mice	Sample et al. (1996)	1	26.36	NA	NOAEL was estimated from the LOAEL.	High	
Benzo(a)pyrene	1.31	No change in mouse survival	32.8	Increase in pulmonary adenoma in mice	PRC (1994)	1	1.31	6.55	The nature of the effect is not likely to cause a significant effect on growth, reproduction or survival. Thus, the data satisfy the requirements described in the text for calculating a threshold.	High	
Benzo(a)anthracene	*No Values Available*									NA	No data available
Benzo(b)fluoranthene	*No Values Available*									NA	No data available
Benzo(g,h,i)perylene	*No Values Available*									NA	No data available
Benzo(k)fluoranthene	*No Values Available*									NA	No data available
Benzyl alcohol	75	NOAEL estimated from LOAEL	750	Decreased body weight and maternal mortality in mouse pups.	Attachment 3	10	7.5	NA	The NOAEL value was estimated from the LOAEL TRV.	Moderate	

194

Table B-2
TRVs for Terrestrial Vertebrate Receptors

ECOI	NOAEL (mg/kg day)	NOAEL Endpoint	Lowest Bounded LOAEL (mg/kg day)	LOAEL Endpoint	TRV Source	Uncertainty Factor	Final NOAEL (mg/kg day)	Threshold (mg/kg day)	Rationale For Calculation	TRV Confidence	Confidence Notes
Beryllium	0.532	No increase in rat mortality	0.63	Decrease in rat growth	USEPA (2003)	1	0.532	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	Very High	
bis(2-chloroethyl)ether	7.1	No effect on mortality in rat.	14.3	Decreased survival in rat.	Attachment 3	NA	NA	NA	35% of the control animals were dead at 52 weeks versus 96% of the test group at the LOAEL. No threshold TRV was calculated.	NA	Only 1 study was available for 1 species with a mortality endpoint. The data are inadequate to calculate a final TRV.
bis(2-chloroisopropyl)ether	35.8	No effect on erythrocytes.	198	Sublethal erythrocyte destruction.	Attachment 3	NA	NA	NA	The primary literature source was not obtained. The study was presented in IRIS as the only available oral study for the eCOI. NOAEL and LOAEL endpoints are both for sublethal erythrocyte destruction and the ability of that endpoint to predict ecologically relevant population effects is highly questionable.	NA	Only 1 study was available for 1 species with a systemic endpoint that is not likely to growth, reproduction or mortality effects.
Bis(2-ethylhexyl)phthalate	18.3	No significant reproductive effects in mice	183	Significant reproductive effects in mice	Sample et al. (1996)	1	18.3	NA	Original study was not reviewed and not enough information is presented in Sample et al (1996) to meet threshold criteria calculation.	High	
Boron	28	No increase in rat sterility	93.6	Increase in rat sterility	Sample et al. (1996)	1	28	NA	Original study was not reviewed and not enough information is presented in Sample et al (1996) to meet threshold criteria calculation.	High	
Bromodichloromethane	100	No effects on growth or reproduction in rats.	200	Developmental effects in neonate rats.	Attachment 3	10	10	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	Moderate	
Bromoform	50	No effects on growth, development, or reproduction in rats.	NA	NA	Attachment 3	10	5	NA	No effects were noted at the highest dose level.	Moderate	
Bromomethane (methyl bromide)	7.1	No effects to stomach lining in rat.	35.7	Changes to the forestomach lining of rats.	Attachment 3	NA	NA	NA	Only oral toxicity study available. Endpoints are non-reproductive, gorwth, or mortality. Endpoints based on changes to the forestomach lining. The ability of the LOAEL endpoint to predict ecologically relevant effects is questionable.	NA	Only 1 study was available for 1 species with a systemic endpoint that is not likely to growth, reproduction or mortality effects.
4-Bromophenyl phenyl ether	No Values Available									NA	No data available
Butylbenzylphthalate	470	No testicular effects in rats.	1417	Testicular effects in rats.	Attachment 3	10	47	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	Moderate	
Cadmium	0.77	No change in rat growth	0.91	Decrease in sheep growth	USEPA (2003)	1	0.77	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	Very High	
Carbazole	21.1	NOAEL was estimated from the LOAEL value.	228	Increase in mortality in mice.	Attachment 3	NA	NA	NA	NOAEL was estimated from the LOAEL	NA	Only 1 study was available for 1 species with a mortality endpoint. The data are inadequate to calculate a final TRV.
Carbon disulfide	100	No reproductive effects.	200	IRIS states "some adverse effects in fetus"	Attachment 3	10	10	NA	Not enough information is available to calculate threshold TRV.	Low	

195

Table B-2

TRVs for Terrestrial Vertebrate Receptors

ECOI	NOAEL (mg/kg day)	NOAEL Endpoint	Lowest Bounded LOAEL (mg/kg day)	LOAEL Endpoint	TRV Source	Uncertainty Factor	Final NOAEL (mg/kg day)	Threshold (mg/kg day)	Rationale For Calculation	TRV Confidence	Confidence Notes
Carbon Tetrachloride	16	No effects on rat reproduction	NA	No effects at the highest study dose	Sample et al. (1996)	1	16	NA	No LOAEL was presented.	High	
Chlordane	4.6	No adverse reproductive effects in mice	9.2	Reduction of number of mouse offspring	Sample et al. (1996)	1	4.6	NA	Original study was not reviewed and not enough information is presented in Sample et al (1996) to meet threshold criteria calculation.	High	
4-Chloroaniline	12.5	No effects on growth or mortality in rats.	25	Increased mortality and decreased growth in rats.	Attachment 3	10	1.25	NA	The primary literature source was not obtained. Study was reviewed in IRIS. IRIS reports LOAEL at 12.5, but the endpoint was for splenic lesions. Growth and mortality endpoints were linked with 25 mg/kg day dose. No effects were noted for growth or mortality at the 12.5 mg/kg day dose. Not enough information regarding number of animals affected was available to calculate a threshold TRV.	Moderate	
Chlorobenzene	43	No observed mortality in rats.	86	Increased mortality in rat.	Attachment 3	5	8.6	12.2	The magnitude of the response was small. Thus, the data satisfy the requirements described in the text for calculating a threshold.	Moderate	
Chloroethane	*No Values Available*									NA	No data available
Chloroform	15	No organ level effects	41	Increase in gonadal atrophy	Sample et al. (1996)	1	15	NA	Not enough information is available to calculate a threshold TRV.	High	
Chloromethane	*No Values Available*									NA	No data available
2-Chloronaphthalene	250	No liver effects in mice.	600	Increase in liver growth.	Attachment 3	NA	NA	NA	The primary literature source for the LOAEL was not reviewed. Not enough information is available to calculate a threshold TRV.	NA	Only 1 study was available for 1 species with a systemic endpoint that is not likely to growth, reproduction or mortality effects.
2-Chlorophenol	5	Increase in still births and decreased litter size in rat.	50	Increase in still births and decreased litter size in rat.	Attachment 3	10	0.5	NA	Not enough information is available to calculate threshold TRV.	Moderate	
Chromium III	2737	No effects on rat reproduction and life span	NA	No effects at the highest study dose	Sample et al. (1996)	1	2737	NA	No LOAEL was presented.	High	
Chromium VI	3.28	No effects on rat body weight or food consumption	13.14	Increased mortality in rats	Sample et al. (1996)	1	3.28	NA	No LOAEL was presented.	High	
Chrysene	*No Values Available*									NA	No data available
cis-1,2- dichloroethene	32	No change in rat body weight.	97	Decrease in rat body weight (males only)	Attachment 3	10	3.2	NA	Not enough information is available to calculate a threshold TRV.	Low	
Cobalt	7.34	Mean value	10.9	Decrease in rat progeny weight	USEPA (2003)	1	7.34	NA	Not enough information is available to calculate a threshold TRV.	Very High	
Copper	2.67	No immune response effects	631.58	Increased mortality and decreased body weight in mice.	PRC (1994)	1	2.67	NA	Not enough data available for calculation of threshold	High	
Cyanide (Total)	68.7	No biologically significant reproductive effects in rats	NA	No effects at the highest study dose	Sample et al. (1996)	1	68.7	NA	No LOAEL was presented.	High	
4,4-DDD	141	Mortality in mouse	NA	NA	Attachment 3	5	28.2	NA	No LOAEL value available.	Moderate	
4,4-DDE	11	No increase in mortality in rat.	22	Increased mortality in rat.	Attachment 3	10	1.1	NA	LOAEL value represents an EC35 which is outside of the agreed upon effect range.	Moderate	

196

Table B-2
TRVs for Terrestrial Vertebrate Receptors

ECOI	NOAEL (mg/kg day)	NOAEL Endpoint	Lowest Bounded LOAEL (mg/kg day)	LOAEL Endpoint	TRV Source	Uncertainty Factor	Final NOAEL (mg/kg day)	Threshold (mg/kg day)	Rationale For Calculation	TRV Confidence	Confidence Notes
DDT	0.8	No change in rat reproduction	16	Decrease in offspring growth	PRC (1994)	1	0.8	NA	Not enough information is available to calculate a threshold TRV.	High	
Dibenzofuran	400	No effects on rat growth	NA	No effects at the highest study dose	Attachment 3	10	40	NA	Low confidence is placed on the TRVs due to the documentation reviewed and the age of the study. No threshold TRV is calculated.	Low	
Dibenz(a,h)anthracene	*No Values Available*									NA	No data available
Dibromochloromethane	100	No effects on growth or reproduction in rats.	200	Decrease in maternal body weight gain.	Attachment 3	10	10	NA	No information regarding the number of animals affected was available. No threshold TRV was calculated.	Low	
Dicamba	3	No effects on fetal body weight and reproduction.	10	Slightly reduced fetal body weight and increase in the loss of embryos impanted in the uterine wall.	Attachment 3	1	3	NA	Not enough information is available for the LOAEL value to calculate a threshold TRV.	High	
1,2-Dichlorobenzene (o-)	42.9	No mortality effects on rats.	85.7	Inreased mortality in male rats	Attachment 3	NA	NA	NA	42 of 50 animals died at the LOAEL level versus 19 of 50 at the control. IRIS suggests that experimental error is the cause of dealth, but to remain conservative, no threshold TRV is calculated.	NA	Only 1 study was available for 1 species with a mortality endpoint. The data are inadequate to calculate a final TRV.
1,4 Dichlorobenzene (-p)	107	Mortality in rat.	214	Mortality in rat.	Attachment 3	1	107	151	The magnitude of the response was small. Thus, the data satisfy the requirements described in the text for calculating a threshold.	High	
3,3-Dichlorobenzidine	4.8	Mortality in rat. Mortality was noted in the lowest dose level and NOAEL was estimated from the LOAEL	48	Increase in rat mortality.	Attachment 3	NA	NA	NA	NOAEL was estimated from the LOAEL	NA	Only 1 study was available for 1 species with a mortality endpoint. The data are inadequate to calculate a final TRV.
1,1 Dichloroethane	27.3	Mortality in rat.	273	NA	Attachment 3	5	5.46	NA	NOAEL was estimated from the LOAEL	Good	
1,2-Dichloroethane	50	No reproductive effects in mice	NA	No effects at the highest study dose	Sample et al. (1996)	1	50	NA	No LOAEL was presented.	High	
1,2-Dichloroethene	45.2	No biologically significant effects in mice	NA	No effects at the highest study dose	Sample et al. (1996)	1	45.2	NA	No LOAEL was presented.	High	
1,1-Dichloroethene	30	No biologically significant reproductive effects in rats	NA	No effects at the highest study dose	Sample et al. (1996)	1	30	NA	No LOAEL was presented.	High	
trans-1,2-dichloroethene	452	No change in body weight.	NA	NA	Attachment 3	10	45.2	NA	No effects at highest dose	Low	
Dichlorodifluoromethane	15	No effects on rat body weight.	150	Decrease in rat body weight.	Attachment 3	10	1.5	NA	Not enough information is available to calculate a threshold TRV.	Low	
2,4-Dichlorophenol	5	No reproductive effects in mouse.	50	Decreased mean litter size in mouse.	Attachment 3	1	5	NA	The primary source was not located. The data were presented in ATSDR for chlorophenols. The LOAEL is based on decreased litter size but the level of effect is not clear so no threshold TRV was calculated.	High	
4-(2,4-Dichlorophenoxy) Butyric Acid	8	No reproductive or mortality effects in dogs.	25	Increase mortality and potential reproductive effects in dogs.	Attachment 3	10	0.8	NA	No information regarding the number of animals affected was available. No threshold TRV was calculated.	Low	

Table B-2
TRVs for Terrestrial Vertebrate Receptors

ECOI	NOAEL (mg/kg day)	NOAEL Endpoint	Lowest Bounded LOAEL (mg/kg day)	LOAEL Endpoint	TRV Source	Uncertainty Factor	Final NOAEL (mg/kg day)	Threshold (mg/kg day)	Rationale For Calculation	TRV Confidence	Confidence Notes
1,2 Dichloropropane	89	Mortality in mouse	179	Mortality in mouse	Attachment 3	1	89	126	The magnitude of the response was small. Thus, the data satisfy the requirements described in the text for calculating a threshold.	High	
1,3-Dichloropropene	5	No effect on growth in rat.	15	Small decrease in body weight gain.	Attachment 3	1	5	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	High	
Dieldrin	0.015	No change to rat progeny weight	0.03	Decrease in rat progeny weight	USEPA (2003)	1	0.015	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	Very High	
Diethyl Ether	500	No effect on rat body weight.	2000	Decrease in rat body weight.	Attachment 3	10	50	NA	Not enough information was available to calculate the threshold TRV.	Low	
Diethyphthalate	4583	No significant reproductive effects in mice	NA	No effects at the highest study dose	Sample et al. (1996)	1	4583	NA	No LOAEL was presented.	High	
Dimethoate	No Values Available									NA	No studies scored >65, so no TRVs are available.
1,2-Dimethylbenzene	No Values Available									NA	No data available
2,4-Dimethylphenol	No Values Available									NA	No data available
Dimethylphthalate	3500	No change in reproductive rates.	5000	Increase in maternal mortality.	Attachment 3	10	350	NA	Study was acute during a critical lifestage. No reproductive effects were noted at LOAEL. Acute mortality was noted at LOAEL.	Moderate	
Di-n-butylphthalate	550	No significant reproductive effects in mice	1833	Reduction in total mouse reproduction	Sample et al. (1996)	1	550	NA	Original study was not reviewed and not enough information is presented in Sample et al (1996) to meet threshold criteria calculation.	High	
Di-n-hexylphthalate	55	NOAEL estimated from LOAEL	550	Reproductive effects in mice	Sample et al. (1996)	1	55	NA	NOAEL was estimated from the LOAEL.	High	
4,6-Dinitro-2-methylphenol	10	No reproductive or mortality effects in rats.	20	Effects on spermatogenesis and mortality in rats.	Attachment 3	10	1	NA	The primary literature source was not obtained. Study was reviewed in ATSDR. The LOAEL is for both reproduction and mortality. Several other studies are presented, but were not able to be obtained. All presented NOAELs only that were less than 10 mg/kg day so this study was selected as the best single source of information. No bounded LOAELs less than 20 were presented for relevant endpoints, however, to remain conservative no threshold TRV was calculated.	Low	
2,4-Dinitrophenol	125	No reproductive or maternal/fetal mortality effects in mice.	350	Increase in testicular atrophy in mice.	Attachment 3	1	125	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	High	
2,4-Dinitrotoluene	0.057	NOAEL was estimated from the LOAEL	0.57	Increase in rat testicular degeneration.	Attachment 3	1	0.057	NA	NOAEL was estimated from the LOAEL.	High	
2,6-Dinitrotoluene	11	No reproductive effects in mice.	35	Decreased spermatogenesis in rats.	Attachment 3	1	11	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	Moderate	

198

Table B-2
TRVs for Terrestrial Vertebrate Receptors

ECOI	NOAEL (mg/kg day)	NOAEL Endpoint	Lowest Bounded LOAEL (mg/kg day)	LOAEL Endpoint	TRV Source	Uncertainty Factor	Final NOAEL (mg/kg day)	Threshold (mg/kg day)	Rationale For Calculation	TRV Confidence	Confidence Notes
Di-n-octyphthalate	1668	No change in testicular morphology.	7500	Decrease in seminal vessicle weight.	Attachment 3	1	1668	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	High	
1,4 Dioxane	148	No effect on rat mortality.	1015	Increase in mortality in rat.	Attachment 3	5	29.6	NA	30 to 35% increase in mortality rate at the lowest bounded LOAEL. No threshold TRV calculated.	Good	
Dioxin (2,3,7,8-TCDD)	0.000001	No reproductive effects in rats.	0.00001	Decreased fertility and neonatal survival in rats	Sample et al. (1996)	1	0.000001	NA	Original study was not reviewed and not enough information is presented in Sample et al (1996) to meet threshold criteria calculation.	High	
Endosulfan	0.15	No significant reproductive effects in rats	NA	No effects at the highest study dose	Sample et al. (1996)	1	0.15	NA	No LOAEL was presented.	High	
Endosulfan I	*No Values Available*									NA	No data available
Endosulfan II	*No Values Available*									NA	No data available
Endrin	0.092	NOAEL estimated from LOAEL	0.92	Reduction in mouse parental survival, litter size, and number of young	Sample et al. (1996)	1	0.092	NA	NOAEL was estimated from the LOAEL.	High	
Ethyl acetate	900	No effects on body weight or survival in rats.	3600	Decrease in survival and body weight in rats.	Attachment 3	10	90	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	Moderate	
Ethylbenzene	97	No systemic or tissue level effects in rats.	291	Increase in liver and kidney weight.	Attachment 3	NA	NA	NA	The nature of the effect is not likely to cause a significant effect on growth, reproduction or survival. Thus, the data satisfy the requirements described in the text for calculating a threshold. However, due to the low confidence in the TRV, no threshold was calculated.	NA	Only 1 study was available for 1 species with a systemic endpoint that is not likely to growth, reproduction or mortality effects.
Fluoranthene	500	No effect on mouse mortality.	NA	NA	Attachment 3	NA	NA	NA	No effects noted at the highest dose level.	NA	Only 1 study was available for 1 species with a mortality endpoint. The data are inadequate to calculate a final TRV.
Fluorene	250	No effects.	500	Multiple, non-lethal effects.	Attachment 3	NA	NA	NA	Not enough information is available to calculate threshold TRV.	NA	Only 1 study was available for 1 species with a systemic endpoint that is not likely to growth, reproduction or mortality effects.
Fluoride	31.37	No effect in mink kit survivorship	52.75	Effects on mink kit survivorship	Sample et al. (1996)	1	31.37	NA	Original study was not reviewed and not enough information is presented in Sample et al (1996) to meet threshold criteria calculation.	High	
Furan	*No Values Available*									NA	No data available
Heptachlor	0.13	Rat reproduction	6.8	Decrease in pup weight in rats	PRC (1994)	1	0.13	NA	The effects were noted to be in the mid-range, therefore, no threshold was calculated	High	
Heptachlor epoxide	0.125	No effect to pup (dog) mortality.	0.175	Increase in pup mortality.	Attachment 3	1	0.125	NA	Not enough information is available to calculate threshold TRV.	High	

199

Table B-2
TRVs for Terrestrial Vertebrate Receptors

ECOI	NOAEL (mg/kg day)	NOAEL Endpoint	Lowest Bounded LOAEL (mg/kg day)	LOAEL Endpoint	TRV Source	Uncertainty Factor	Final NOAEL (mg/kg day)	Threshold (mg/kg day)	Rationale For Calculation	TRV Confidence	Confidence Notes
Hexachlorobenzene	2	No effect on rat reproduction	8	Decreased pup viability in rats.	Attachment 3	1	2	NA	Both NOAEL and LOAEL values are for reduced offspring survival. Dose rates estimated by ATSDR. No information regarding numbers of individuals affects is available. No threshold TRV was calculated.	High	
Hexachlorobutadiene	2	No changes in growth, reproduction, or mortality in rat.	20	Decreased growth and increased mortality in rats.	Attachment 3	1	2	NA	No information regarding the number of animals affected was available. No threshold TRV was calculated.	High	
Hexachlorocyclohexane (alpha)	36	No effects on mouse growth	NA	NA	Attachment 3	1	36	NA	No effectes noted at the highest dose level.	Good	
Hexachlorocyclohexane (beta)	0.4	NOAEL for gonadal atrophy in rats	2	Gonadal atrophy in rats	Sample et al. (1996)	1	0.4	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	High	
Hexachlorocyclohexane (Mixed)	1.6	No increase in rat maternal mortality, litter size, or reduced birth weight	3.2	Reduction in rat birth weight	Sample et al. (1996)	1	1.6	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	High	
Hexachlorocyclopentadiene	54	No effect on mouse survival.	107	Increase in mouse mortality	Attachment 3	5	10.8	NA	NOAEL and LOAEL for mortality. 100% mortality was noted in males at LOAEL dose so no threshold was calculated.	Moderate	
Hexachloroethane	7	No effect on rat body weight.	14	Decrease in rat body weight.	Attachment 3	10	0.7	0.99	The magnitude of the response was small. Thus, the data satisfy the requirements described in the text for calculating a threshold.	Moderate	
Indeno (1,2,3-cd)pyrene	*No Values Available*									NA	No data available
Iron	*No Values Available*									NA	No data available
1,3-Isobenzofurnadione	3786	No effect on mouse mortality.	NA	NA	Attachment 3	5	757.2	NA	No effect at the highest dose level.	Moderate	
Isophorone	179	No effect on rat mortality.	357	Increase in rat mortality.	Attachment 3	NA	NA	NA	40% increase in mortality versus control. No threshold should be calculated.	NA	Only 1 study was available for 1 species with a mortality endpoint. The data are inadequate to calculate a final TRV.
Isopropylbenzene	331	No effects on kidney weight in female rats.	551	Change in kidney weight in female rats.	Attachment 3	NA	NA	NA	The percentage of the treatment group that was effected is unknown, however, the ability of the endpoint to predict ecologically relevant population effects is questionable.	NA	Only 1 study was available for 1 species with a systemic endpoint that is not likely to growth, reproduction or mortality effects.
Lead	4.7	No change in rat growth	5	Decrease in rat progeny weight and growth	USEPA (2003)	1	4.7	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	Very High	
Lindane	0.05	Rat reproduction	3.75	Increase in mortality	PRC (1994)	1	0.05	NA	LOAEL represented 100% pup mortality.	High	
Lithium	9.4	No reproductive effects in rats	18.8	Decrease in the number of rat offspring	Sample et al. (1996)	1	9.4	NA	Original study was not reviewed and not enough information is presented in Sample et al (1996) to meet threshold criteria calculation.	High	
Manganese	13.7	No change in mouse testicle weight	159.1	Decrease in mouse testicle weight	PRC (1994)	1	13.7	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	High	

200

Table B-2

TRVs for Terrestrial Vertebrate Receptors

ECOI	NOAEL (mg/kg day)	NOAEL Endpoint	Lowest Bounded LOAEL (mg/kg day)	LOAEL Endpoint	TRV Source	Uncertainty Factor	Final NOAEL (mg/kg day)	Threshold (mg/kg day)	Rationale For Calculation	TRV Confidence	Confidence Notes
Mercury	0.027	NOAEL was estimated from LOAEL	0.27	Increase in mortality	PRC (1994)	1	0.027	NA	NOAEL was estimated from LOAEL	High	
Methoxychlor	2.5	NOAEL was estimated from LOAEL	50	Decrease in rat reproduction	PRC (1994)	1	2.5	NA	NOAEL was estimated from LOAEL	High	
Methyl Ethyl Ketone	1771	No effects on rat reproduction	4571	Reduction in rat reproduction	Sample et al. (1996)	1	1771	NA	Original study was not reviewed and not enough information is presented in Sample et al (1996) to meet threshold criteria calculation.	High	
Methyl Methacrylate	237	No effect on survival or histopathology.	NA	NA	Attachment 3	NA	NA	NA	No effects predicted at the highest dose level.	NA	Only 1 study was available for 1 species with a mortality endpoint. The data are inadequate to calculate a final TRV.
Methylene Chloride	5.85	No effects on rat liver histology	50	Histological changes in rat livers	Sample et al. (1996)	1	5.85	17.10	The nature of the effect is not likely to cause a significant effect on growth, reproduction or survival. Thus, the data satisfy the requirements described in the text for calculating a threshold.	High	
1-Methylnapthalene	140	No effect on mouse growth or gross histopathology.	NA	NA	Attachment 3	10	14	NA	No growth or mortality effects noted at highest dose levels.	Low	
2-Methylnaphthalene	52.3	No decrease in body weight	110.7	Decrease in body weight in mouse.	Attachment 3	10	5.23	7.6	The magnitude of the response was small. Thus, the data satisfy the requirements described in the text for calculating a threshold.	Moderate	
4-Methyl-2-Pentanone	25	No effects on liver or kidney function in rats	NA	No effects at the highest study dose	Sample et al. (1996)	1	25	NA	No LOAEL was presented.	High	
2-Methylphenol (o-cresol)	219.2	No adverse reproductive effects in mink	NA	No effects at the highest study dose	Sample et al. (1996)	1	219.2	NA	No LOAEL was presented.	High	
4-Methlyphenol (p-cresol)	*No Values Available*									NA	No data available
Methyl-tertbutyl ether	*No Values Available*									NA	No studies scored >65, so no TRVs are available.
Molybdenum	0.26	NOAEL estimated from LOAEL	2.6	Increased incidence of runts in mice litters	Sample et al. (1996)	1	0.26	NA	NOAEL was estimated from the LOAEL.	High	
Napthalene	50	No change in rat body weight gain during gestation	150	Changes in water consumption and decrease in body weight gain during gestation	PRC (1994)	1	50	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	High	
Nickel	0.133	NOAEL was estimated from LOAEL	1.33	Increase in pup mortality in rats	PRC (1994)	1	0.133	NA	NOAEL was estimated from LOAEL	High	
Nitrate	507	No adverse reproductive effects to guinea pig	1130	Decrease in number of live guinea pig births	Sample et al. (1996)	1	507	NA	Original study was not reviewed and not enough information is presented in Sample et al (1996) to meet threshold criteria calculation.	High	
Nitrite	*No Values Available*									NA	No data available
2-Nitroaniline	100	No effects on maternal toxicity.	300	Overt maternal toxicity.	Attachment 3	10	10	NA	Not enough information is available to calculate a threshold TRV.	Moderate	
4-Nitroaniline	71	No effects on survival and body weight in mouse.	85	Decrease in fetal weight.	Attachment 3	1	71	NA	Unknown level of effect at the LOAEL. No threshold TRV calculated.	High	
4 Nitrophenol	25	No increase in mortality in rat.	70	Increased mortality in rat.	Attachment 3	1	25	NA	Not enough information is available to calculate a threshold TRV.	High	

201

Table B-2
TRVs for Terrestrial Vertebrate Receptors

ECOI	NOAEL (mg/kg day)	NOAEL Endpoint	Lowest Bounded LOAEL (mg/kg day)	LOAEL Endpoint	TRV Source	Uncertainty Factor	Final NOAEL (mg/kg day)	Threshold (mg/kg day)	Rationale For Calculation	TRV Confidence	Confidence Notes
n-Nitrosodiphenylamine	58	No effect on rat mortality.	232	Increase in rat mortality.	Attachment 3	1	58	116	The magnitude of the response was small. Thus, the data satisfy the requirements described in the text for calculating a threshold.	Good	
n-Nitrosodipropylamine	90	No effect on rat mortality.	NA	NA	Attachment 3	NA	NA	NA	No effects were noted at the highest dose level.	NA	Data was available for 1 species with a mortality endpoint. The data are inadequate to calculate a final TRV.
p-Nitrotoluene	110	No effects on rat reproduction.	125	Endometrial hyperplasia in female rats.	Attachment 3	1	110	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	High	
Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	270	No change in body weight gain.	620	Decrease in body weight gain through study.	Attachment 3	10	27	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	Low	
PCB (Total)	0.36	No decrease in mouse liver weight	0.71	Decrease in mouse reproductive capacity	PRC (1994)	1	0.36	0.51	The magnitude of the response was small. Thus, the data satisfy the requirements described in the text for calculating a threshold.	High	
Pendimethalin	25	No effect on rat pup body weight or survival.	250	Decrease rat pup body weight and survival.	Attachment 3	10	2.5	NA	Not enough information is available to calculate threshold TRV.	Low	
Pentachlorobenzene	8.5	No effects on neonate rat livers.	18	Some effects on livers in neonatal rats.	Attachment 3	10	0.85	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	Low	
Pentachloronitrobenzene	200	No effect on rat fetal development	NA	NA	Attachment 3	1	200	NA	No effects noted at the highest dose level.	Good	
Pentachlorophenol	0.24	No adverse growth or survival effects in rats	2.4	Reduction in growth and survival in rats	Sample et al. (1996)	1	0.24	0.76	The magnitude of the response was small. Thus, the data satisfy the requirements described in the text for calculating a threshold.	High	
Phenanthrene	*No Values Available*									NA	No data available
Phenol	40	No effect on rat reproduction	53.3	Decrease in numbers of live births due to maternal respiratory toxicity.	Attachment 3	1	40	NA	Not enough information is available to calculate threshold TRV.	High	
Pyrene	250	No effect on mouse mortality.	NA	NA	Attachment 3	NA	NA	NA	No effects noted at the highest dose level.	NA	Only 1 study was available for 1 species with a mortality endpoint. The data are inadequate to calculate a final TRV.
Selenium	0.05	No increase in liver lesions in mice	1.21	Decrease in mouse reproductive success	PRC (1994)	1	0.05	NA	The effects were noted to be in the mid-range, therefore, no threshold was calculated	High	
Silver	No Values Available									NA	No data available
Strontium	263	No effects on rat body weight	NA	No effects at the highest study dose	Sample et al. (1996)	1	263	NA	No LOAEL was presented.	High	
Styrene	300	No developmental or reproductive effects in rats.	400	Possible reproductive effects due to decrease in spermatogenesis.	Attachment 3	10	30	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	Moderate	
Sulfotep	3.19	No systemic effects on rats.	NA	NA	Attachment 3	NA	NA	NA	No effects predicted at the highest dose level.	NA	Only 1 study was available for 1 species with a systemic endpoint that is not likely to growth, reproduction or mortality effects.

202

Table B-2
TRVs for Terrestrial Vertebrate Receptors

ECOI	NOAEL (mg/kg day)	NOAEL Endpoint	Lowest Bounded LOAEL (mg/kg day)	LOAEL Endpoint	TRV Source	Uncertainty Factor	Final NOAEL (mg/kg day)	Threshold (mg/kg day)	Rationale For Calculation	TRV Confidence	Confidence Notes
1,2,4,5-Tetrachlorobenzene	3.4	No effects on mouse kidney.	34	Severe kidney lesions	Attachment 3	NA	NA	NA	NOAEL and LOAEL are based on kidney lesions. No reproductive, developmental, growth or mortality measures were identified and ecologically relevant effects are questionable. However, due to the severity of the kidney lesions, no threshold TRV was calculated.	NA	Only 1 study was available for 1 species with a systemic endpoint that is not likely to growth, reproduction or mortality effects.
1,1,2,2-Tetrachloroethane	108	No reproductive effects noted in rat	179	Increase in rat mortality.	Attachment 3	1	108	NA	Not enough information was available to calculate the threshold TRV.	High	
1,1,2,2-Tetrachloroethene	1.4	No effect on mouse liver toxicity	7	Significant increase in mouse liver toxicity	Sample et al. (1996)	1	1.4	3.13	The nature of the effect is not likely to cause a significant effect on growth, reproduction or survival. Thus, the data satisfy the requirements described in the text for calculating a threshold.	High	
2,3,4,6 Tetrachlorophenol	100	No effects on growth or reproduction in rats.	200	Some effects on rat growth and reproduction.	Attachment 3	10	10	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	Moderate	
Thallium	0.48	No hair loss in rats	1.43	Increase in hair loss	PRC (1994)	1	0.48	0.83	The nature of the effect is not likely to cause a significant effect on growth, reproduction or survival. Thus, the data satisfy the requirements described in the text for calculating a threshold.	High	
Tin (Butyltins)	0.25	No systemic effects	15	Midrange of effects less than mortality	PRC (1994)	1	0.25	NA	Not enough data available for calculation of threshold	High	
Titanium	*No Values Available*									NA	No data available
Toluene	26	NOAEL estimated from LOAEL	260	Increase in mouse embryo mortality	Sample et al. (1996)	1	26	NA	NOAEL was estimated from the LOAEL.	High	
Toxaphene	8	No adverse reproductive effects in rats	NA	No effects at the highest study dose	Sample et al. (1996)	1	8	NA	No LOAEL was presented.	High	
1,2,4-Trichlorobenzene	33	No increase in mortality among male rats	53.6	Increase in male rat mortality.	Attachment 3	NA	NA	NA	Not enough information is available to calculate a threshold TRV.	NA	Only 1 study was available for 1 species with a mortality endpoint. The data are inadequate to calculate a final TRV.
1,1,1-Trichloroethane	1000	No adverse reproductive effects in mice	NA	No effects at the highest study dose	Sample et al. (1996)	1	1000	NA	No LOAEL was presented.	High	
1,1,2-Trichloroethane	350	No effects on mouse neonate survival.	NA	NA	Attachment 3	NA	NA	NA	No effects at highest dose	NA	Only 1 study was available for 1 species with a mortality endpoint. The data are inadequate to calculate a final TRV.
Trichloroethene[1]	0.7	NOAEL estimated from LOAEL	7	Increase in liver toxicity in mice	Sample et al. (1996)	1	0.7	NA	NOAEL was estimated from the LOAEL.	High	
Trichlorofluoromethane	34.9	NOAEL estimated from LOAEL	349	Increase in mortality in rat.	Attachment 3	NA	NA	NA	Primary source not obtained. Reviewed in IRIS, literature review score was less than 65, but the paper appeared to be sound as discussed in IRIS. Recommend that the value be used with qualifications. Only a LOAEL TRV was available.	NA	Only 1 study was available for 1 species with a mortality endpoint. The data are inadequate to calculate a final TRV.

203

Table B-2
TRVs for Terrestrial Vertebrate Receptors

ECOI	NOAEL (mg/kg day)	NOAEL Endpoint	Lowest Bounded LOAEL (mg/kg day)	LOAEL Endpoint	TRV Source	Uncertainty Factor	Final NOAEL (mg/kg day)	Threshold (mg/kg day)	Rationale For Calculation	TRV Confidence	Confidence Notes
2,4,6-Trinitrotoluene	5	No reproductive effects in rats.	25	Testicular degeneration in rats.	Attachment 3	10	0.5	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	Moderate	
2,4,5-Trichlorophenol	100	Reproduction and mortality in Rats	300	Slight changes in liver and kidney function in rats.	Attachment 3	NA	NA	NA	The nature of the effect is not likely to cause a significant effect on growth, reproduction or survival. Thus, the data satisfy the requirements described in the text for calculating a threshold.	NA	Only 1 study was available for 1 species with a systemic endpoint that is not likely to growth, reproduction or mortality effects.
2,4,6-Trichlorophenol	3	No reproductive effects in mouse.	30	Decreased mean litter size in mouse.	Attachment 3	10	0.3	NA	The primary source was not located. The data were presented in ATSDR for chlorophenols. The LOAEL is based on decreased litter size but the level of effect is not clear so no threshold TRV was calculated.	Moderate	
2,4,5-Trichlorophenoxy Acetic Acid	3	No effect on rat development or neonate survivial.	10	Decrease in rat neonate survival	Attachment 3	10	0.3	0.55	The magnitude of the response was small. Thus, the data satisfy the requirements described in the text for calculating a threshold.	Moderate	
1,2,3 Trichloropropane	125	No mortality effects on rats.	250	Mortality in rats.	Attachment 3	5	25	NA	100% mortality noted at LOAEL. No threshold TRV calculated.	Moderate	
Trifluralin	32.5	No effect on rat reproduction	100	Reproductive effects in rats.	Attachment 3	10	3.25	NA	Primary source not obtained. Reviewed as critical study in IRIS. Not enough information was available to calculate threshold TRV.	Moderate	
1,2,4 Trimethylbenzene	357	No mortality effects on rats.	1429	Mortality in rats.	Attachment 3	NA	NA	NA	100% mortality noted at LOAEL. No threshold TRV calculated.	NA	Only 1 study was available for 1 species with a systemic endpoint that is not likely to growth, reproduction or mortality effects.
1,3,5 Trimethylbenzene	143	No effect on body weight in rats.	429	Decrease in body weight in rat.	Attachment 3	10	14.3	NA	The magnitude of the response was small. Thus, the data satisfy the requirements described in the text for calculating a threshold. However, due to the low confidence in the TRV, no threshold was calculated.	Low	
Uranium	3.07	No effects on mouse reproduction	6.13	Significant reproductive effects in mice	Sample et al. (1996)	1	3.07	NA	Original study was not reviewed and not enough information is presented in Sample et al (1996) to meet threshold criteria calculation.	High	
Vanadium	0.21	NOAEL estimated from LOAEL	2.1	Significant reproductive effects in rats	Sample et al. (1996)	1	0.21	NA	NOAEL was estimated from the LOAEL.	High	
Vinyl acetate	235	No reproductive effects in rats.	431	Decrease in rat pup weight gain.	Attachment 3	10	23.5	NA	Primary source not obtained. Reviewed in ATSDR. It is recommended that the NOAEL TRV be used but not enough information is available to calculate a threshold TRV.	Moderate	
Vinyl Chloride	0.17	NOAEL estimated from LOAEL	1.7	Reduced survivorship in rats	Sample et al. (1996)	1	0.17	NA	NOAEL was estimated from the LOAEL.	High	

204

Table B-2
TRVs for Terrestrial Vertebrate Receptors

ECOI	NOAEL (mg/kg day)	NOAEL Endpoint	Lowest Bounded LOAEL (mg/kg day)	LOAEL Endpoint	TRV Source	Uncertainty Factor	Final NOAEL (mg/kg day)	Threshold (mg/kg day)	Rationale For Calculation	TRV Confidence	Confidence Notes
Xylene (Mixed)	2.1	No effects on mouse reproduction	2.6	Reduced fetal weights and increase in fetal malformations in mice	Sample et al. (1996)	1	2.1	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	High	
Zinc	9.61	NOAEL was estimated from LOAEL	411.4	Increase in fetal developmental effects in rats	PRC (1994)	1	9.61	NA	NOAEL was estimated from LOAEL	High	

205

Table B-2
TRVs for Terrestrial Vertebrate Receptors

ECOI	NOAEL (mg/kg day)	NOAEL Endpoint	Lowest Bounded LOAEL (mg/kg day)	LOAEL Endpoint	TRV Source	Uncertainty Factor	Final NOAEL (mg/kg day)	Threshold (mg/kg day)	Rationale For Calculation	TRV Confidence	Confidence Notes
Bird											
Acenaphthene	*No Values Available*									NA	No data available
Acetone	*No Values Available*									NA	No data available
Aldrin	*No Values Available*									NA	No data available
Ammonium (as ammonia)	*No Values Available*									NA	No data available
Anthracene	*No Values Available*									NA	No data available
Antimony	*No Values Available*									NA	No data available
Arsenic	5.5	No change in duckling growth and reproduction	22.01	Decrease in duckling growth and reproduction	PRC (1994)	1	5.5	NA	The effects were noted to be in the mid-range, therefore, no threshold was calculated	High	
Aroclor 1016	See PCB (total)										
Aroclor 1221	See PCB (total)										
Aroclor 1232	See PCB (total)										
Aroclor 1242	See PCB (total)										
Aroclor 1248	See PCB (total)										
Aroclor 1254	See PCB (total)										
Aroclor 1260	See PCB (total)										
Barium	20.8	No mortality noted in chicks	41.7	5% mortality in chicks	Sample et al. (1996)	1	20.8	29.45	The magnitude of the response was small. Thus, the data satisfy the requirements described in the text for calculating a threshold.	High	
Benzene	*No Values Available*									NA	No data available
Benzo(a)pyrene	*No Values Available*									NA	No data available
Benzo(a)anthracene	*No Values Available*									NA	No data available
Benzo(b)fluoranthene	*No Values Available*									NA	No data available
Benzo(g,h,i)perylene	*No Values Available*									NA	No data available
Benzo(k)fluoranthene	*No Values Available*									NA	No data available
Benzyl alcohol	*No Values Available*									NA	No data available
Beryllium	*No Values Available*									NA	No data available
bis(2-chloroethyl)ether	*No Values Available*									NA	No data available
bis(2-chloroisopropyl)ether	*No Values Available*									NA	No data available
bis(2-ethylhexyl)phthalate	1.1	No reproductive effects in ringed doves	NA	No effects at highest study dose	Sample et al. (1996)	1	1.1	NA	No LOAEL was presented.	High	
Boron	28.8	No reduction in mallard egg fertility and duckling growth	100	Effects on mallard reproduction, growth, and mortality	Sample et al. (1996)	1	28.8	NA	LOAEL dose caused multiple effects.	High	
Bromodichloromethane	*No Values Available*									NA	No data available
Bromoform	*No Values Available*									NA	No data available
Bromomethane (methyl bromide)	*No Values Available*									NA	No data available
4-Bromophenyl phenyl ether	*No Values Available*									NA	No data available
Butylbenzylphthalate	*No Values Available*									NA	No data available
Cadmium	1.47	Mean value	2.37	Decrease in chicken reproduction	USEPA (2003)	1	1.47	NA	No threshold value calculated because the study was not reviewed and effect levels are unknown.	Very High	
Carbazole	*No Values Available*									NA	No data available
Carbon disulfide	*No Values Available*									NA	No data available
Carbon Tetrachloride	*No Values Available*									NA	No data available
Chlordane	2.14	No increase in red-winged blackbird mortality	10.7	Increase in blackbird mortality	Sample et al. (1996)	1	2.14	NA	LOAEL dose cause 26% mortality in red-winged blackbirds.	High	
4-Chloroaniline	*No Values Available*									NA	No data available
Chlorobenzene	*No Values Available*									NA	No data available
Chloroethane	*No Values Available*									NA	No data available
Chloroform	*No Values Available*									NA	No data available
Chloromethane	*No Values Available*									NA	No data available
2-Chloronaphthalene	*No Values Available*									NA	No data available
2-Chlorophenol	*No Values Available*									NA	No data available

206

Table B-2

TRVs for Terrestrial Vertebrate Receptors

ECOI	NOAEL (mg/kg day)	NOAEL Endpoint	Lowest Bounded LOAEL (mg/kg day)	LOAEL Endpoint	TRV Source	Uncertainty Factor	Final NOAEL (mg/kg day)	Threshold (mg/kg day)	Rationale For Calculation	TRV Confidence	Confidence Notes
Chromium III	1	No effect on black duckling survival	5	Reduction in black duckling survival	Sample et al. (1996)	1	1	NA	Original study was not reviewed and not enough information is presented in Sample et al (1996) to meet threshold criteria calculation.	High	
Chromium VI	*No Values Available*									NA	No data available
Chrysene	*No Values Available*									NA	No data available
Cobalt	7.61	Mean value	7.8	Decrease in chicken growth	USEPA (2003)	1	7.61	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	Very High	
Copper	2.3	No effects noted	52.3	Increase in chicken gizzard erosion	PRC (1994)	1	2.3	11.0	The nature of the effect is not likely to cause a significant effect on growth, reproduction or survival. Thus, the data satisfy the requirements described in the text for calculating a threshold.	High	
Cyanide (Total)	*No Values Available*									NA	No data available
4,4-DDD	*No Values Available*									NA	No data available
4,4-DDE	0.06	NOAEL was estimated from LOAEL	0.6	Increase in reproductive effects in mallards	PRC (1994)	1	0.06	NA	NOAEL was estimated from LOAEL	High	
4,4-DDT	0.009	NOAEL was estimated from LOAEL	1.5	Increase in reproductive effects in mallards	PRC (1994)	1	0.009	NA	NOAEL was estimated from LOAEL	High	
Dibenzofuran	*No Values Available*									NA	No data available
Dibenz(a,h,)anthracene	*No Values Available*									NA	No data available
Dibromochloromethane	*No Values Available*									NA	No data available
Dicamba	*No Values Available*									NA	No data available
1,2-Dichlorobenzene (o-)	*No Values Available*									NA	No data available
1,4 Dichlorobenzene (-p)	*No Values Available*									NA	No data available
3,3-Dichlorobenzidine	*No Values Available*									NA	No data available
1,1 Dichloroethane	*No Values Available*									NA	No data available
1,2-Dichloroethane	17.2	No effect on chicken egg production	34.4	Reduced egg production in chickens	Sample et al. (1996)	1	17.2	NA	Original study was not reviewed and not enough information is presented in Sample et al (1996) to meet threshold criteria calculation.	High	
1,1-Dichloroethene	*No Values Available*									NA	No data available
1,2-Dichloroethene	*No Values Available*									NA	No data available
cis-1,2- dichloroethene	*No Values Available*									NA	No data available
trans-1,2-dichloroethene	*No Values Available*									NA	No data available
Dichlorodifluoromethane	*No Values Available*									NA	No data available
2,4-Dichlorophenol	*No Values Available*									NA	No data available
4-(2,4-Dichlorophenoxy) Butyric Acid	*No Values Available*									NA	No data available
1,2 Dichloropropane	*No Values Available*									NA	No data available
1,3-Dichloropropene	*No Values Available*									NA	No data available
Dieldrin	0.071	No change in mallard growth	0.179	Increase in Guinea fowl mortality	USEPA (2003)	1	0.071	NA	No threshold value calculated because the study was not reviewed and effect levels are unknown.	Very High	
Diethyl Ether	*No Values Available*									NA	No data available
Diethyphthalate	*No Values Available*									NA	No data available
Dimethoate	0.4	NOAEL estimated from LOAEL	4	Minimum lethal dose in pheasant	Attachment 3	5	0.08	NA	No threshold value calculated because the study was not reviewed and effect levels are unknown.	NA	Moderate
1,2-Dimethylbenzene	*No Values Available*									NA	No data available
4,6-Dinitro-2-methylphenol	*No Values Available*									NA	No data available
2,4-Dimethylphenol	*No Values Available*									NA	No data available
2,4-Dinitrophenol	*No Values Available*									NA	No data available
2,4 Dinitrotoluene	*No Values Available*									NA	No data available
2,6-Dinitrotoluene	*No Values Available*									NA	No data available

Table B-2
TRVs for Terrestrial Vertebrate Receptors

ECOI	NOAEL (mg/kg day)	NOAEL Endpoint	Lowest Bounded LOAEL (mg/kg day)	LOAEL Endpoint	TRV Source	Uncertainty Factor	Final NOAEL (mg/kg day)	Threshold (mg/kg day)	Rationale For Calculation	TRV Confidence	Confidence Notes
Dimethylphthalate	*No Values Available*									NA	No data available
Di-n-butylphthalate[1]	0.11	NOAEL estimated from LOAEL	1.1	Reduction in eggshell thickness and water permeability in ringed doves	Sample et al. (1996)	1	0.11	NA	NOAEL was estimated from the LOAEL.	High	
Di-n-hexylphthalate	*No Values Available*									NA	No data available
Di-n-octyphthalate	*No Values Available*									NA	No data available
1,4 Dioxane	*No Values Available*									NA	No data available
Dioxin (2,3,7,8-TCDD)	0.000014	No effect on pheasant egg production and hatchability	0.00014	Decrease in egg production and hatchability	Sample et al. (1996)	1	0.000014	NA	Original study was not reviewed and not enough information is presented in Sample et al (1996) to meet threshold criteria calculation.	High	
Endosulfan	10	No effect on grey partridge reproduction	NA	No effects at highest study dose	Sample et al. (1996)	1	10	NA	No LOAEL was presented.	High	
Endosulfan I	*No Values Available*									NA	No data available
Endosulfan II	*No Values Available*									NA	No data available
Endrin	0.01	NOAEL estimated from LOAEL	0.1	Decrease in hatchling success and egg production in screech owls	Sample et al. (1996)	1	0.01	NA	NOAEL was estimated from the LOAEL.	High	
Ethyl acetate	*No Values Available*									NA	No data available
Ethylbenzene	*No Values Available*									NA	No data available
Fluoranthene	*No Values Available*									NA	No data available
Fluorene	*No Values Available*									NA	No data available
Fluoride	7.8	No adverse effect on screech owl fertility and hatchling success	32	Reduction in screech owl fertility and hatchling success	Sample et al. (1996)	1	7.8	NA	Original study was not reviewed and not enough information is presented in Sample et al (1996) to meet threshold criteria calculation.	High	
Furan	*No Values Available*									NA	No data available
Heptachlor	*No Values Available*									NA	No data available
Heptachlor epoxide	*No Values Available*									NA	No data available
Hexachlorobenzene	0.563	No effect on Japanese quail mortality	2.25	Signficant decrease in quail hatchability	Attachment 3	10	0.0563	NA	Original study was not reviewed.	NA	Moderate
Hexachlorobutadiene	30	No effects noted at the highest dose level for growth, survival, or reproduction in Japanese quail.	NA	No effects at highest study dose	Attachment 3	10	3	NA	No effects noted at the highest dose level.	NA	Low
Hexachlorocyclohexane (alpha)	*No Values Available*									NA	No data available
Hexachlorocyclohexane (beta)	*No Values Available*									NA	No data available
Hexachlorocyclohexane (Mixed)	0.56	No reduction in Japanese quail egg hatchability or egg volume	2.25	Decrease in egg hatchability in Japanese quail	Sample et al. (1996)	1	0.56	NA	Original study was not reviewed and not enough information is presented in Sample et al (1996) to meet threshold criteria calculation.	High	
Hexachlorocyclopentadiene	*No Values Available*									NA	No data available
Hexachloroethane	*No Values Available*									NA	No data available
Indeno (1,2,3-cd)pyrene	*No Values Available*									NA	No data available
Iron	*No Values Available*									NA	No data available
1,3-Isobenzofurnadione	*No Values Available*									NA	No data available
Isophorone	*No Values Available*									NA	No data available
Isopropylbenzene	*No Values Available*									NA	No data available
Lead	1.63	No change in chicken reproduction	1.94	Decrease in Japanese quail reproduction	USEPA (2003)	1	1.63	NA	No threshold value calculated because the study was not reviewed and effect levels are unknown.	Very High	
Lindane	2	NOAEL estimated from LOAEL	20	Reduced eggshell thickness and reproduction in mallards	Sample et al. (1996)	1	2	NA	NOAEL was estimated from the LOAEL.	High	
Lithium	*No Values Available*									NA	No data available

208

Table B-2
TRVs for Terrestrial Vertebrate Receptors

ECOI	NOAEL (mg/kg day)	NOAEL Endpoint	Lowest Bounded LOAEL (mg/kg day)	LOAEL Endpoint	TRV Source	Uncertainty Factor	Final NOAEL (mg/kg day)	Threshold (mg/kg day)	Rationale For Calculation	TRV Confidence	Confidence Notes
Manganese[1]	77.6	NOAEL was estimated from LOAEL	776	Decrease in Japanese quail motor skills development and increase in aggressive behavior	PRC (1994)	1	77.6	NA	NOAEL was estimated from LOAEL	High	
Mercury	0.039	NOAEL was estimated from LOAEL	0.18	Increase in mortality in mallards	PRC (1994)	1	0.039	NA	NOAEL was estimated from LOAEL	High	
Methoxychlor	*No Values Available*									NA	No data available
Methyl Ethyl Ketone	*No Values Available*									NA	No data available
Methyl Methacrylate	*No Values Available*									NA	No data available
Methylene Chloride	*No Values Available*									NA	No data available
1-Methylnapthalene	*No Values Available*									NA	No data available
2-Methylnaphthalene	*No Values Available*									NA	No data available
4-Methyl-2-Pentanone	*No Values Available*									NA	No data available
4-Methlyphenol (p-cresol)	*No Values Available*									NA	No data available
2-Methylphenol (o-cresol)	*No Values Available*									NA	No data available
Methyl-tertbutyl ether	*No Values Available*									NA	No data available
Molybdenum	3.5	NOAEL estimated from LOAEL	35.3	Embryonic viability reduced in chickens	Sample et al. (1996)	1	3.5	NA	NOAEL was estimated from the LOAEL.	High	
Napthalene	*No Values Available*									NA	No data available
Nickel	1.38	No increase in tremors or toe and leg joint edema	55.26	Increase in tremors and toe and knee joint edema in mallard	PRC (1994)	1	1.38	8.7	The nature of the effect is not likely to cause a significant effect on growth, reproduction or survival. Thus, the data satisfy the requirements described in the text for calculating a threshold.	High	
Nitrate	*No Values Available*									NA	No data available
Nitrite	*No Values Available*									NA	No data available
2-Nitroaniline	*No Values Available*									NA	No data available
4-Nitroanoline	*No Values Available*									NA	No data available
4 Nitrophenol	*No Values Available*									NA	No data available
n-Nitrosodiphenylamine	*No Values Available*									NA	No data available
n-Nitrosodipropylamine	*No Values Available*									NA	No data available
p-Nitrotoluene	*No Values Available*									NA	No data available
Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	*No Values Available*									NA	No data available
PCB (Total)	0.09	NOAEL was estimated from LOAEL	1.27	Decrease in egg hatchability	PRC (1994)	1	0.09	NA	NOAEL was estimated from LOAEL	High	
Pendimethalin	*No Values Available*									NA	No data available
Pentachlorobenzene	*No Values Available*									NA	No data available
Pentachloronitrobenzene	7.07	No change in chicken reproduction	70.7	Decrease in egg production and hatchability in chickens	Sample et al. (1996)	1	7.07	NA	Original study was not reviewed and not enough information is presented in Sample et al (1996) to meet threshold criteria calculation.	High	
Pentachlorophenol	*No Values Available*									NA	No data available
Phenanthrene	*No Values Available*									NA	No data available
Phenol	*No Values Available*									NA	No data available
Pyrene	*No Values Available*									NA	No data available
Selenium	0.23	No reproductive effects in mallards	0.93	Decrease in hatchling success	PRC (1994)	1	0.23	NA		High	
Silver	*No Values Available*									NA	No data available
Strontium	*No Values Available*									NA	No data available
Styrene	*No Values Available*									NA	No data available
Sulfotep	*No Values Available*									NA	No data available
1,2,4,5-Tetrachlorobenzene	*No Values Available*									NA	No data available
1,1,2,2-Tetrachloroethane	*No Values Available*									NA	No data available
1,1,2,2-Tetrachloroethene	*No Values Available*									NA	No data available
2,3,4,6 Tetrachlorophenol	*No Values Available*									NA	No data available
Thallium	*No Values Available*									NA	No data available

209

Table B-2
TRVs for Terrestrial Vertebrate Receptors

ECOI	NOAEL (mg/kg day)	NOAEL Endpoint	Lowest Bounded LOAEL (mg/kg day)	LOAEL Endpoint	TRV Source	Uncertainty Factor	Final NOAEL (mg/kg day)	Threshold (mg/kg day)	Rationale For Calculation	TRV Confidence	Confidence Notes
Tin (Butyltins)	0.73	No change in Japanese quail growth and reproduction	18.34	Decrease in Japanese quail reproduction	PRC (1994)	1	0.73	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.	High	
Titanium	*No Values Available*									NA	No data available
Toluene	*No Values Available*									NA	No data available
Toxaphene	*No Values Available*									NA	No data available
1,2,4-Trichlorobenzene	*No Values Available*									NA	No data available
1,1,1-Trichloroethane	*No Values Available*									NA	No data available
1,1,2-Trichloroethane	*No Values Available*									NA	No data available
Trichloroethene	*No Values Available*									NA	No data available
Trichlorofluoromethane	*No Values Available*									NA	No data available
2,4,5-Trichlorophenol	*No Values Available*									NA	No data available
2,4,6-Trichlorophenol	*No Values Available*									NA	No data available
2,4,5-Trichlorophenoxy Acetic Acid	*No Values Available*									NA	No data available
1,2,3 Trichloropropane	*No Values Available*									NA	No data available
Trifluralin	*No Values Available*									NA	No data available
1,2,4 Trimethylbenzene	*No Values Available*									NA	No data available
1,3,5 Trimethylbenzene	*No Values Available*									NA	No data available
2,4,6 Trinitrotoluene	*No Values Available*									NA	No data available
Uranium	16	No effect on black duck mortality, body weight, or blood chemistry; No liver/kidney effects	NA	No effects at highest study dose	Sample et al. (1996)	1	16	NA	No LOAEL was presented.	High	
Vanadium	11.4	No effects on mallard mortality, body weight, or blood chemistry	NA	No effects at highest study dose	Sample et al. (1996)	1	11.4	NA	No LOAEL was presented.	High	
Vinyl acetate	*No Values Available*									NA	No data available
Vinyl Chloride	*No Values Available*									NA	No data available
Xylene (Mixed)	*No Values Available*									NA	No data available
Zinc	17.2	NOAEL was estimated from LOAEL	172	Decrease in mallard body weight	PRC (1994)	1	17.2	NA	NOAEL was estimated from LOAEL	High	

NOTES:

[1] The nature of the effect is not likely to cause a significant effect on growth, reproduction, or survival.

Threshold TRVs were independently calculated using the procedures outline in Section 3.1.4

The LOAEL TRVs for Butyltin (birds) and nickel (mammals) represent more conservative TRVs than those published in PRC (1994) as High-TRVs. A more conservative TRV was selected as the LOAEL from that document to remain consistent with the Site-specific TRV selection process.

The support data for the TRVs from the Attachment Table 3 source is provided in Attachment Table 3.

1. NA – No TRV has been identified or the TRV has been deemed unacceptable for use in ECOPC selection.
2. Low – TRVs that have data for only one species looking at one endpoint (non-mortality) and from one primary literature source.
3. Moderate – TRVs that have multiple primary literature sources looking at one endpoint (non-mortality or mortality) but with only one species evaluated.
4. Good – For TRVs that have either multiple species with one endpoint from multiple studies or those TRVs with multiple species and multiple endpoints from only one study.
5. High – For TRVs that have multiple study sources looking at multiple endpoints and more than one species.
6. Very High – All EcoSSLs (EPA 2003a) will be assigned this level of confidence by default.

210

Table B-3 A

Bioaccumulation Factors for Inorganic ECOIs and Organic ECOI With Regression-Based Bioaccumulation Factors

	Soil to Plant					Soil to Earthworm					Soil to Small Mammal				
ECOI	Model	B0	B1	BAF	BAF Reference	Model	B0	B1	BAF	BAF Reference	Model	B0	B1	BAF	BAF Reference
Aluminum	BAF			0.005	ORNL 1998	BAF			0.118	Sample et al. 1998a	BAF			0.093	Sample et al. 1998b
Anthracene	ln(Cp) = B0 + B1(lnCs)	0.079	0.87	NA	EPA 2003a	BAF			29.8	Log Kow from EPA 2003a	BAF			30.95	Log Kow EPA 2003a
Antimony	ln(Cp) = B0 + B1(lnCs)	-3.233	0.94	NA	EPA 2003a	BAF			1	Conservative Estimate	BAF			0.003	Baes et al. 1984
Arsenic	BAF			1.103	ORNL 1998	ln(Ce) = B0 +B1(lnCs)	-1.42	0.71	NA	Sample et al. 1998a	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA	Sample et al. 1998b
Barium	BAF			0.477	ORNL 1998	BAF			0.16	Sample et al. 1998a	BAF			0.1121	Sample et al. 1998b
Benzo(a)anthracene	ln(Cp) = B0 + B1(lnCs)	-1.44	0.79	NA	EPA 2003a	BAF			31.2	Log Kow from EPA 2003a	BAF			28.7	Log Kow EPA 2003a
Benzo(a)pyrene	ln(Cp) = B0 + B1(lnCs)	-2.053	0.64	NA	EPA 2003a	BAF			31.9	Log Kow from EPA 2003a	BAF			28.49	Log Kow EPA 2003a
Benzo(b)fluoranthene	ln(Cp) = B0 + B1(lnCs)	-1.44	0.79	NA	EPA 2003a	BAF			32	Log Kow from EPA 2003a	BAF			28.75	Log Kow EPA 2003a
Benzo(ghi)perylene	ln(Cp) = B0 + B1(lnCs)	-2.565	1.3	NA	EPA 2003a	BAF			32.6	Log Kow from EPA 2003a	BAF			29.55	Log Kow EPA 2003a
Benzo(k)fluoranthene	ln(Cp) = B0 + B1(lnCs)	-1.44	0.79	NA	EPA 2003a	BAF			32.3	Log Kow from EPA 2003a	BAF			28.68	Log Kow EPA 2003a
Beryllium	BAF			0.01	Baes et al. 1984	BAF			1.18	Sample et al. 1998a	BAF			0.003	Baes et al. 1984
Boron	BAF			4	Baes et al. 1984	BAF			1	Conservative Estimate	BAF			0.01	Baes et al. 1984
Cadmium	ln(Cp) = B0 + B1(lnCs)	-0.476	0.55	NA	ORNL 1998	ln(Ce) = B0 +B1(lnCs)	2.114	0.8	NA	EPA 2003a	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA	Sample et al. 1998b
Chromium III	BAF			0.084	ORNL 1998	BAF			3.162	Sample et al. 1998a	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	Sample et al. 1998b
Chromium VI	BAF			0.084	ORNL 1998	BAF			3.162	Sample et al. 1998a	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	Sample et al. 1998b
Chrysene	ln(Cp) = B0 + B1(lnCs)	-1.44	0.79	NA	EPA 2003a	BAF			25.6	Log Kow from EPA 2003a	BAF			28.54	Log Kow EPA 2003a
Cobalt	BAF			0.0248	ORNL 1998	BAF			0.291	Sample et al. 1998a	BAF			0.1	Sample et al. 1998b
Copper	ln(Cp) = B0 + B1(lnCs)	0.669	0.39	NA	ORNL 1998	ln(Ce) = B0 +B1(lnCs)	1.675	0.26	NA	Sample et al. 1998a	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA	Sample et al. 1998b
Cyanide	BAF			1	Conservative Estimate	BAF			1	Conservative Estimate	BAF			1	Conservative Estimate
Dibenz(a,h)anthracene	ln(Cp) = B0 + B1(lnCs)	-1.44	0.79	NA	EPA 2003a	BAF			32.6	Log Kow from EPA 2003a	BAF			28.61	Log Kow EPA 2003a
Fluoranthene	ln(Cp) = B0 + B1(lnCs)	-1.44	0.79	NA	EPA 2003a	BAF			30.4	Log Kow from EPA 2003a	BAF			33.69	Log Kow EPA 2003a
Fluorene	ln(Cp) = B0 + B1(lnCs)	-1.44	0.79	NA	EPA 2003a	BAF			29.4	Log Kow from EPA 2003a	BAF			28.03	Log Kow EPA 2003a
Fluoride	BAF			1	Conservative Estimate	BAF			1	Conservative Estimate	BAF			0.362	Sample et al. 1998b
Indeno(1,2,3-cd)pyrene	ln(Cp) = B0 + B1(lnCs)	-1.44	0.79	NA	EPA 2003a	BAF			32.6	Log Kow from EPA 2003a	BAF			28.54	Log Kow EPA 2003a
Iron	BAF			0.01	ORNL 1998	BAF			0.078	Sample et al. 1998a	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA	Sample et al. 1998b
Lead	ln(Cp) = B0 + B1(lnCs)	-1.328	0.56	NA	ORNL 1998	ln(Ce) = B0 +B1(lnCs)	-0.22	0.81	NA	Sample et al. 1998a	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA	Sample et al. 1998b
Lithium	BAF			0.025	Baes et al. 1984	BAF			0.217	Sample et al. 1998a	BAF			0.006	Baes et al. 1984
Manganese	BAF			0.234	ORNL 1998	ln(Ce) = B0 +B1(lnCs)	-0.81	0.68	NA	Sample et al. 1998a	BAF			0.037	Sample et al. 1998b
Mercury	ln(Cp) = B0 + B1(lnCs)	-0.996	0.54	NA	ORNL 1998	ln(Ce) = B0 +B1(lnCs)	-0.68	0.12	NA	Sample et al. 1998a	BAF			0.192	Sample et al. 1998b
Molybdenum	BAF	-		0.25	Baes et al. 1984	BAF			2.09	Sample et al. 1998a	BAF			0.035	Baes et al. 1984
Napthalene	ln(Cp) = B0 + B1(lnCs)	-1.44	0.79	NA	EPA 2003a	BAF			28.4	Log Kow from EPA 2003a	BAF			31.94	Log Kow EPA 2003a
Nickel	ln(Cp) = B0 + B1(lnCs)	-2.224	0.75	NA	ORNL 1998	BAF			4.73	Sample et al. 1998a	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA	Sample et al. 1998b
Nitrate	BAF			1	Conservative Estimate	BAF			1	Conservative Estimate	BAF			1	Conservative Estimate
PCB	BAF			0.25	Log Kow (Table B-3 B)	ln(Ce) = B0 +B1(lnCs)	1.41	1.36	NA	Sample et al. 1998a	BAF			28.79	Log Kow EPA 2003a
Phenanthrene	ln(Cp) = B0 + B1(lnCs)	-1.44	0.79	NA	EPA 2003a	BAF			29.8	Log Kow from EPA 2003a	BAF			35.48	Log Kow EPA 2003a
Pyrene	ln(Cp) = B0 + B1(lnCs)	-1.44	0.79	NA	EPA 2003a	BAF			30.4	Log Kow from EPA 2003a	BAF			31.54	Log Kow EPA 2003a
Selenium	ln(Cp) = B0 + B1(lnCs)	-0.678	1.1	NA	ORNL 1998	ln(Ce) = B0 +B1(lnCs)	-0.08	0.73	NA	Sample et al. 1998a	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA	Sample et al. 1998b
Silver	BAF			0.0367	ORNL 1998	BAF			15.3	Sample et al. 1998a	BAF			0.81	Sample et al. 1998b
Strontium	BAF			2.5	Baes et al. 1984	BAF			0.278	Sample et al. 1998a	BAF			0.002	Baes et al. 1984
TCDD (Dioxin)	BAF			0.22	Log Kow (Table B-3 B)	ln(Ce) = B0 +B1(lnCs)	3.533	1.18	NA	Sample et al. 1998a	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA	Sample et al. 1998b
Thallium	BAF			0.004	Baes et al. 1984	BAF			1	Conservative Estimate	BAF			0.123	Sample et al. 1998b
Tin	BAF			0.03	Baes et al. 1984	BAF			1	Conservative Estimate	BAF			0.21	Baes et al. 1984
Titanium	BAF			0.0055	Baes et al. 1984	BAF			1	Conservative Estimate	BAF			0.075	Baes et al. 1984
Uranium	BAF			0.0085	Baes et al. 1984	BAF			0.063	Sample et al. 1998a	BAF			0.00004	Baes et al. 1984
Vanadium	BAF			0.0097	ORNL 1998	BAF			0.088	Sample et al. 1998a	BAF			0.0131	Sample et al. 1998b
Zinc	ln(Cp) = B0 + B1(lnCs)	1.575	0.56	NA	ORNL 1998	ln(Ce) = B0 +B1(lnCs)	4.449	0.33	NA	Sample et al. 1998a	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA	Sample et al. 1998b

Notes: BAFs selected from ORNL (1998) and Sample et al. (1998a, 1998b) represent the 90th percentile uptake factor.
Plant BAFs selected from Baes et al. 1984 are based on uptake from soil into stems and leaves.
Soil to earthworm BAF for selenium represents the regression presented in Sample et al. (1998a) in which the outlier was removed.
Soil to small mammal BAFs were selected from Sample et al. (1998b) for the omnivore receptor, where available. If the ominovore receptor was not available, the general receptor was selected.
Small mammal BAFs selected from Baes et al. (1984) represent diet to tissue concentrations. To estimate the soil to tissue BAF, the formula $BAF_{sm}=((0.5 * BAF_{plant}) + (0.5 * BAF_{invert})) * BAF_{baes} * IR_{cow})$, where Ir_{cow} = 50 kg/day.
Where regression equations are used for prey item BAFs, the Log Kow BAF from Table B-3 B was used in the calculation. For antimony, the 90th percentile BAF for plants (ORNL 1998) was used in the calculation.

ln (Cp) = Natural log of the ECOI concentration in plants
ln (Ce) = Natural log of the ECOI concentration in earthworms
ln (Cm) = Natural log of the ECOI concentration in mammals
ln (Cs) = Natural log of the ECOI concentration in soil
B0 = slope of the regression line
B1 = intercept of the regression line

Table B-3 B

Log K_{ow}-Based Bioaccumulation Factors for Organic ECOIs

		Log BAF			BAF[b]		
ECOI	Log Kow[a]	Plant	Earthworm	Small Mammal	Plant	Earthworm	Soil to Small Mammal[c]
1,1,1-Trichloroethane	2.68	-0.198	NA	0.299	0.63	27.9	28.39
1,1,2,2-Tetrachloroethane	2.19	-0.145	NA	0.306	0.72	27.4	28.40
1,1,2-Trichloroethane	2.01	-0.126	NA	0.309	0.75	27.2	28.41
1,1-Dichloroethane	1.76	-0.098	NA	0.312	0.80	26.9	28.43
1,1-Dichloroethene	2.12	-0.138	NA	0.307	0.73	27.3	28.41
1,2,3-Trichloropropane	2.5	-0.179	NA	0.302	0.66	27.7	28.39
1,2,4,5-Tetrachlorobenzene	4.57	-0.404	NA	0.272	0.39	30.0	28.43
1,2,4-Trichlorobenzene	3.93	-0.334	NA	0.281	0.46	29.3	28.40
1,2,4-Trimethylbenzene	3.63	-0.302	NA	0.285	0.50	28.9	28.39
1,2-Dichlorobenzene (o-)	3.28	-0.264	NA	0.290	0.54	28.5	28.39
1,2-Dichloroethane	1.83	-0.106	NA	0.311	0.78	27.0	28.43
1,2-Dichloroethene (total)	1.98	-0.122	NA	0.309	0.75	27.1	28.42
1,2-Dichloropropane	2.25	-0.152	NA	0.305	0.71	27.4	28.40
1,2-Dimethylbenzene	3.09	-0.243	NA	0.293	0.57	28.3	28.38
1,3,5-Trimethylbenzene	3.63	-0.302	NA	0.285	0.50	28.9	28.39
1,3-Dichloropropene	2.29	-0.156	NA	0.305	0.70	27.5	28.40
1,3-Isobenzofurnadione	2.07	-0.132	NA	0.308	0.74	27.2	28.41
1,4 Dioxane	-0.32	0.128	NA	0.343	1.34	24.8	28.76
1,4-Dichlorobenzene (p-)	3.28	-0.264	NA	0.290	0.54	28.5	28.39
1-Methylnapthalene	3.72	-0.311	NA	0.284	0.49	29.0	28.39
2,3,4,6 Tetrachlorophenol	4.09	-0.352	NA	0.279	0.44	29.5	28.41
2,3,7,8-TCDD (dioxin)	6.92	-0.659	NA	0.238	0.22	32.9	28.63
2,4,5-Trichlorophenol	3.45	-0.282	NA	0.288	0.52	28.7	28.39
2,4,5-Trichlorophenoxy acetic acid	3.26	-0.261	NA	0.291	0.55	28.5	28.39
2,4,6-Trichlorophenol	3.45	-0.282	NA	0.288	0.52	28.7	28.39
2,4,6-Trinitrotoluene	1.99	-0.123	NA	0.309	0.75	27.1	28.41
2,4-Dichlorophenol	2.8	-0.211	NA	0.297	0.61	28.0	28.39
2,4-Dimethylphenol	2.61	-0.191	NA	0.300	0.64	27.8	28.39
2,4-Dinitrophenol	1.73	-0.095	NA	0.313	0.80	26.9	28.43
2,4-Dinitrotoluene	2.18	-0.144	NA	0.306	0.72	27.3	28.40
2,6-Dinitrotoluene	2.18	-0.144	NA	0.306	0.72	27.3	28.40
2-Butanone	0.26	0.065	NA	0.334	1.16	25.4	28.63
2-Chloronaphthalene	3.81	-0.321	NA	0.283	0.48	29.1	28.40
2-Chlorophenol	2.16	-0.142	NA	0.307	0.72	27.3	28.41
2-Methylnapthalene	3.72	-0.311	NA	0.284	0.49	29.0	28.39
2-Methylphenol (o-cresol)	2.06	-0.131	NA	0.308	0.74	27.2	28.41
2-Nitroaniline	2.02	-0.127	NA	0.309	0.75	27.2	28.41
3,3-Dichlorobenzidine	3.21	-0.256	NA	0.291	0.55	28.5	28.39
4-(2,4-Dichlorophenoxy) butyric acid	3.6	-0.298	NA	0.286	0.50	28.9	28.39
4,4-DDD	5.87	-0.545	NA	0.253	**0.08**	31.6	28.34
4,4-DDE	6.76	-0.642	NA	0.240	**0.62**	32.7	28.96
4,4-DDT	6.53	-0.617	NA	0.243	**0.08**	32.4	28.45
4,6-Dinitro-2-methylphenol	2.27	-0.154	NA	0.305	0.70	27.4	28.40
4-Bromophenyl phenyl ether	4.94	-0.444	NA	0.266	0.36	30.5	28.45
4-Chloroaniline	1.72	-0.094	NA	0.313	0.81	26.9	28.43
4-Isopropyltoluene	4	-0.342	NA	0.280	0.46	29.4	28.40
4-Methyl-2-pentanone	1.16	-0.033	NA	0.321	0.93	26.3	28.49
4-Methylphenol (p-cresol)	2.06	-0.131	NA	0.308	0.74	27.2	28.41
4-Nitroanòline	1.47	-0.067	NA	0.317	0.86	26.6	28.45
4-Nitrophenol	1.91	-0.115	NA	0.310	0.77	27.1	28.42
Acenaphthene	4.15	-0.358	NA	0.278	0.44	29.5	28.41
Acenaphthylene	3.94	-0.335	NA	0.281	0.46	29.3	28.40
Acetone	-0.24	0.119	NA	0.341	1.32	24.9	28.74
Aldrin	6.75	-0.641	NA	0.240	0.23	32.7	28.61
alpha-BHC (hexachlorocyclohexane, alpha)	4.26	-0.370	NA	0.276	0.43	29.7	28.41
alpha-Chlordane	6.26	-0.588	NA	0.247	0.26	32.1	28.56
Ammonium (as ammonia)	0.23	0.068	NA	0.335	1.17	25.3	28.63
Anthracene	4.35	-0.380	NA	0.275	*3.10*	29.8	30.95
Aroclor 1016	5.69	-0.526	NA	0.255	0.30	31.4	28.51
Aroclor 1221	4.4	-0.385	NA	0.274	0.41	29.8	28.42
Aroclor 1232	4.4	-0.385	NA	0.274	0.41	29.8	28.42
Aroclor 1242	6.34	-0.596	NA	0.246	0.25	32.2	28.57
Aroclor 1248	6.34	-0.596	NA	0.246	0.25	32.2	28.57
Aroclor 1254	6.98	-0.666	NA	0.237	0.22	33.0	28.64
Aroclor 1260	8.27	-0.806	NA	0.218	0.16	34.7	28.79
Benzene	1.99	-0.123	NA	0.309	0.75	27.1	28.41

211

Table B-3 B

Log K_{ow}-Based Bioaccumulation Factors for Organic ECOIs

		Log BAF			BAF[b]		
ECOI	Log Kow[a]	Plant	Earthworm	Small Mammal	Plant[c]	Earthworm	Soil to Small Mammal[d]
Benzene, 1,2,4-trimethyl	3.63	-0.302	NA	0.285	0.50	28.9	28.39
Benzene, 1,3,5-trimethyl	3.63	-0.302	NA	0.285	0.50	28.9	28.39
Benzo(a)anthracene	5.52	-0.507	NA	0.258	0.54	31.2	28.70
Benzo(a)pyrene	6.11	-0.571	NA	0.249	0.20	31.9	28.49
Benzo(b)fluoranthene	6.2	-0.581	NA	0.248	0.48	32.0	28.75
Benzo(g,h,i)perylene	6.7	-0.635	NA	0.241	1.31	32.6	29.55
Benzo(k)fluoranthene	6.44	-0.607	NA	0.245	0.36	32.3	28.68
Benzoic Acid	1.87	-0.110	NA	0.311	0.78	27.0	28.42
Benzyl Alcohol	1.08	-0.024	NA	0.322	0.95	26.2	28.50
beta-BHC (Hexachlorocyclohexane, beta)	4.26	-0.370	NA	0.276	0.43	29.7	28.41
beta-Chlordane	6.26	-0.588	NA	0.247	0.26	32.1	28.56
bis(2-chloroethyl)ether	1.56	-0.077	NA	0.315	0.84	26.7	28.45
bis(2-chloroisopropyl)ether	2.39	-0.167	NA	0.303	0.68	27.6	28.40
bis(2-ethylhexyl)phthalate	8.39	-0.819	NA	0.216	0.15	34.9	28.81
Bromodichloromethane	1.61	-0.082	NA	0.315	0.83	26.7	28.44
Bromoform	1.79	-0.102	NA	0.312	0.79	26.9	28.43
Bromomethane (methyl bromide)	1.43	-0.063	NA	0.317	0.87	26.5	28.46
Butylbenzylphthalate	4.48	-0.394	NA	0.273	0.40	29.9	28.43
Carbazole	3.23	-0.258	NA	0.291	0.55	28.5	28.39
Carbon disulfide	1.94	-0.118	NA	0.310	0.76	27.1	28.42
Carbon tetrachloride	2.44	-0.172	NA	0.303	0.67	27.6	28.39
Chlorobenzene	2.64	-0.194	NA	0.300	0.64	27.8	28.39
Chloroethane (ethyl chloride)	1.58	-0.079	NA	0.315	0.83	26.7	28.44
Chloroform	1.52	-0.072	NA	0.316	0.85	26.6	28.45
Chloromethane (methyl chloride)	1.09	-0.026	NA	0.322	0.94	26.2	28.50
Chrysene	0.52	0.036	NA	0.330	1.05	25.6	28.54
cis-1,2-dichloroethene	1.98	-0.122	NA	0.309	0.75	27.1	28.42
cis-1,3-Dichloropropene	2.29	-0.156	NA	0.305	0.70	27.5	28.40
Dibenz(a,h)anthracene	6.7	-0.635	NA	0.241	0.23	32.6	28.61
Dibenzofuran	3.71	-0.310	NA	0.284	0.49	29.0	28.39
Dibromochloromethane	1.7	-0.092	NA	0.313	0.81	26.8	28.43
Dicamba	2.14	-0.140	NA	0.307	0.72	27.3	28.41
Dichlorodifluoromethane	1.82	-0.105	NA	0.312	0.79	27.0	28.43
Dieldrin	5.54	-0.509	NA	0.258	1.64	31.2	29.70
Diethyl Ether	1.05	-0.021	NA	0.323	0.95	26.2	28.50
Diethylphthalate	2.65	-0.195	NA	0.300	0.64	27.8	28.39
Dimethoate	0.28	0.062	NA	0.334	1.15	25.4	28.62
Dimethylphthalate	1.66	-0.088	NA	0.314	0.82	26.8	28.44
Di-n-butylphthalate	4.61	-0.408	NA	0.271	0.39	30.1	28.43
Di-n-octylphthalate	8.54	-0.835	NA	0.214	0.15	35.1	28.83
Di-n-octyphthalate	8.54	-0.835	NA	0.214	0.15	35.1	28.83
Endosulfan (technical)	3.5	-0.288	NA	0.287	0.52	28.8	28.39
Endosulfan I	3.5	-0.288	NA	0.287	0.52	28.8	28.39
Endosulfan II	3.5	-0.288	NA	0.287	0.52	28.8	28.39
Endosulfan sulfate	3.64	-0.303	NA	0.285	0.50	28.9	28.39
Endrin	5.45	-0.500	NA	0.259	0.32	31.1	28.49
Ethyl acetate	1.22	-0.040	NA	0.320	0.91	26.3	28.48
Ethylbenzene	3.03	-0.236	NA	0.294	0.58	28.3	28.39
Fluoranthene	4.93	-0.443	NA	0.267	6.03	30.4	33.69
Fluorene	4.02	-0.344	NA	0.280	0.06	29.4	28.03
Fluoride	0.22	0.069	NA	0.335	1.17	25.3	28.63
Furan	1.36	-0.055	NA	0.318	0.88	26.5	28.46
gamma-BHC (Hexachlorocyclohexane, gamma)	4.26	-0.370	NA	0.276	0.43	29.7	28.41
gamma-Chlordane	6.26	-0.588	NA	0.247	0.26	32.1	28.56
Heptachlor	5.86	-0.544	NA	0.253	0.29	31.6	28.53
Heptachlor epoxide	4.56	-0.403	NA	0.272	0.40	30.0	28.43
Hexachlorobenzene	5.86	-0.544	NA	0.253	0.29	31.6	28.53
Hexachlorobutadiene	4.72	-0.420	NA	0.270	0.38	30.2	28.44
Hexachlorocyclopentadiene	4.63	-0.410	NA	0.271	0.39	30.1	28.43
Hexachloroethane	4.03	-0.345	NA	0.280	0.45	29.4	28.40
Indeno(1,2,3-cd)pyrene	6.7	-0.635	NA	0.241	0.15	32.6	28.54
Isophorone	2.62	-0.192	NA	0.300	0.64	27.8	28.39
Isopropylbenzene	3.45	-0.282	NA	0.288	0.52	28.7	28.39
Methoxychlor	5.67	-0.523	NA	0.256	0.30	31.3	28.51
Methyl ethyl ketone	0.26	0.065	NA	0.334	1.16	25.4	28.63
Methyl Methacrylate	1.28	-0.046	NA	0.319	0.90	26.4	28.47

212

Table B-3 B

Log K_{ow}-Based Bioaccumulation Factors for Organic ECOIs

ECOI	Log Kow[a]	Log BAF: Plant	Log BAF: Earthworm	Log BAF: Small Mammal	BAF[b]: Plant[c]	BAF[b]: Earthworm	BAF[b]: Soil to Small Mammal[d]
Methylene chloride	1.34	-0.053	NA	0.319	0.89	26.5	28.47
Methyl-tertbutyl ether	1.43	-0.063	NA	0.317	0.87	26.5	28.46
Naphthalene	3.17	-0.252	NA	0.292	*4.19*	28.4	31.94
Nitrobenzene	1.81	-0.104	NA	0.312	0.79	26.9	28.43
n-Nitrosodiphenylamine	1.49	-0.069	NA	0.316	0.85	26.6	28.45
n-Nitrosodipropylamine	1.33	-0.052	NA	0.319	0.89	26.4	28.47
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	0.82	0.004	NA	0.326	1.01	25.9	28.53
Pendimethalin	4.82	-0.431	NA	0.268	0.37	30.3	28.45
Pentachlorobenzene	5.03	-0.454	NA	0.265	0.35	30.6	28.46
Pentachloronitrobenzene	5.03	-0.454	NA	0.265	0.35	30.6	28.46
Pentachlorophenol	4.79	-0.428	NA	0.269	0.37	30.3	28.44
Phenanthrene	4.35	-0.380	NA	0.275	*7.92*	29.8	35.48
Phenol	1.51	-0.071	NA	0.316	0.85	26.6	28.45
p-Nitrotoluene	2.36	-0.164	NA	0.304	0.69	27.5	28.40
Pyrene	4.93	-0.443	NA	0.267	*3.70*	30.4	31.54
Styrene	2.89	-0.221	NA	0.296	0.60	28.1	28.39
Sulfotep	3.98	-0.340	NA	0.280	0.46	29.3	28.40
Tetrachloroethene	2.97	-0.230	NA	0.295	0.59	28.2	28.39
Toluene	2.54	-0.183	NA	0.301	0.66	27.7	28.39
Toxaphene	6.79	-0.645	NA	0.240	0.23	32.7	28.62
trans-1,2-dichloroethene	1.98	-0.122	NA	0.309	0.75	27.1	28.42
trans-1,3-dichloropropene	2.29	-0.156	NA	0.305	0.70	27.5	28.40
Trichloroethene	2.47	-0.176	NA	0.302	0.67	27.7	28.39
Trichlorofluoromethane	2.17	-0.143	NA	0.307	0.72	27.3	28.41
Trifluralin	5.31	-0.484	NA	0.261	0.33	30.9	28.48
Vinyl acetate	0.73	0.014	NA	0.327	1.03	25.8	28.54
Vinyl chloride	1.62	-0.083	NA	0.315	0.83	26.7	28.44
Xylene (total)	3.09	-0.243	NA	0.293	0.57	28.3	28.38

[a] Log Kow Values Calculated by KOWWIN software. http://esc.syrres.com/interkow/logkow.htm

[b] Values in **BOLD** were taken from Eco-SSL (EPA 2003a) Guidance (Appendix 4-1) and were not calculated using the equations below

[c] Values in *Italics* were not used in uptake modelling to plants, but were used in the estimation of BAFs from soil to small mammal tissues. Plant uptake models for these ECOIs are presented in Table B-3 A.

[d] Values are for soil to small mammal and are calculated as shown below.

BAF Models From EPA 2003a:

Soil to Plant

Log BAF = -.1087(Log Kow)+0.0927

- Since soil ingestion is accounted for in the intake model, the model for washed vegetation was used.

Soil to Earthworm

BAF = 10^(Log Kow - 0.6)/(foc(10^(0.983(Log Kow + 0.00028))))

Organic Content (foc) assumed to be 0.01 (EPA 2003a)

Diet to Small Mammals

Log BAF_{DSM} = 0.338 - 0.0145(LogKow)

Soil to Small Mammals

BAF = BAF_{DSM} *((0.5 * BAF_{plant}) + (0.5 * BAF_{inv}))

213

214

Table B-4
Sediment ESLs for Aquatic Receptors

ECOI	Sediment ESL (mg/kg)	ESL Reference	Type	Water ESL (ug/L)	Water ESL Source	Koc	Koc Source
Acenaphthene	6.71E-03	CCME 2002	ISQG	NA			
Acenaphthylene	5.87E-03	CCME 2002	ISQG	NA			
Acetone	No Values Available						
Aldrin	8.25E-03	EPA 1997b	EqP	0.017	MIDEQ 2003	48500	Briggs 1981
Aluminum	1.59E+04	MacDonald et al. 1999	SQG	NA			
Anthracene	5.72E-02	MacDonald et al. 2000b	TEC	NA			
Antimony	2.00E+00	MacDonald et al. 1999	SQG	NA			
Arsenic	9.79E+00	MacDonald et al. 2000b	TEC	NA			
Barium	1.89E+02	MacDonald et al. 1999	SQG	NA			
Benzene	2.60E-01	EPA 1997b	EqP	530	CDPHE 2002	49	Abdul et al. 1987
Benzo(a)anthracene	1.08E-01	MacDonald et al. 2000b	TEC	NA			
Benzo(a)pyrene	1.50E-01	MacDonald et al. 2000b	TEC	NA			
Benzo(b)fluoranthene	No Value Available						
Benzo(g,h,i)perylene	1.30E-02	MacDonald et al. 1999	ERL	NA			
Benzo(k)fluoranthene	2.40E-01	MacDonald et al. 1999	LEL	NA			
Benzoic Acid	No Values Available						
Benzyl Alcohol	No Values Available						
Beryllium	No Values Available						
alpha-BHC (Hexachlorocyclohexane, alpha)	4.39E-02	EPA 1997b	EqP	2.2	DOE 1996c	1995	Karickhoff 1981
beta-BHC (Hexachlorocyclohexane, beta)	9.36E-02	EPA 1997b	EqP	2.2	DOE 1996c	4254	Hamaker and Thompson 1972
gamma-BHC (Hexachlorocyclohexane, gamma)	2.37E-03	MacDonald et al. 2000b	TEC	NA			
Bromomethane (methyl bromide)	3.43E-03	EPA 1997b	EqP	35	MIDEQ 2003	9.8	Daelemans and Siebering 1977
2-Butanone	No Values Available						
Butylbenzylphthalate	1.14E+01	EPA 1997b	EqP	67	AWQC	17000	Russell and McDuffie 1986
Cadmium	9.90E-01	MacDonald et al. 2000b	TEC	NA			
Carbazole	2.52E-02	EPA 1997b	EqP	4	MIDEQ 2003	631	Ainsworth et al. 1989
Carbon tetrachloride	7.88E+00	EPA 1997b	EqP	3520	CDPHE 2002	224	Abdul et al. 1987
alpha-Chlordane	3.24E-03	MacDonald et al. 2000b	TEC	NA			
beta-Chlordane	3.24E-03	MacDonald et al. 2000b	TEC	NA			
Chloroform	No Values Available						
bis(2-chloroisopropyl)ether	No Values Available						
Chromium III	4.34E+01	MacDonald et al. 2000b	TEC Chromium (Total)	NA			

215

Table B-4
Sediment ESLs for Aquatic Receptors

ECOI	Sediment ESL (mg/kg)	ESL Reference	Type	Water ESL (ug/L)	Water ESL Source	Koc	Koc Source
Chromium VI	4.34E+01	MacDonald et al. 2000b	TEC Chromium (Total)	NA			
Chrysene	1.66E-01	MacDonald et al. 2000b	TEC	NA			
Cobalt	No Values Available						
Copper	3.16E+01	MacDonald et al. 2000b	TEC	NA			
4,4-DDD	4.88E-03	MacDonald et al. 2000b	TEC	NA			
4,4-DDE	3.16E-03	MacDonald et al. 2000b	TEC	NA			
4,4-DDT	4.16E-03	MacDonald et al. 2000b	TEC	NA			
Dibenz(a,h)anthracene	3.30E-02	MacDonald et al. 2000b	TEC	NA			
Dibenzofuran	3.25E-01	EPA 1997b	EqP	4	MIDEQ 2003	8128	SRC 1988
1,2-Dichloroethane	No Values Available						
1,1-Dichloroethene	No Values Available						
1,2-Dichloroethene (total)	No Values Available						
Diethylphthalate	1.08E-01	EPA 1997b	EqP	110	MIDEQ 2003	98	Russell and McDuffie 1986
Dimethylphthalate	No Values Available						
Di-n-butylphthalate	6.12E-01	EPA 1997b	EqP	9.7	MIDEQ 2003	6310	Ritsema et al. 1989
Di-n-octylphthalate	No Values Available						
Endosulfan I	6.90E-04	EPA 1997b	EqP	0.029	MIDEQ 2003	2385	SRC 1988
bis(2-ethylhexyl)phthalate	2.49E+01	EPA 1997b	EqP	28.5		87420	Russell and McDuffie 1986
Fluoranthene	4.23E-01	MacDonald et al. 2000b	TEC	NA			
Fluorene	7.74E-02	MacDonald et al. 2000b	TEC	NA			
Fluoride (as fluorine)	1.00E-02	MacDonald et al. 1999	ER-L	NA			
Heptachlor	1.32E-04	EPA 1997b	EqP	0.0038	CDPHE 2002	3475	SRC 1988
Heptachlor epoxide	2.47E-03	MacDonald et al. 2000b	TEC	0.0038	AWQC	10.58	SRC 1988
Hexachlorobutadiene	2.30E-02	EPA 1997b	EqP	1	MIDEQ 2003	2300	SRC 1988
Indeno(1,2,3-cd)pyrene	1.70E-02	MacDonald et al. 1999	TEL	NA			
Iron	2.00E+04	MacDonald et al. 1999	LEL	NA			
4-Isopropyltoluene	No Values Available						
Lead	3.58E+01	MacDonald et al. 2000b	TEC	NA			
Lithium	No Values Available						
Manganese	6.30E+02	MacDonald et al. 1999	TEL	NA			
Mercury	1.80E-01	MacDonald et al. 2000b	TEC	NA			
Methoxychlor	2.40E-02	EPA 1997b	EqP	0.03	CDPHE 2002	80000	Karickhoff 1981
Methylene chloride	No Values Available						
2-Methylnaphthalene	2.02E-02	CCME 2002	ISQG	NA			
4-Methyl-2-pentanone	No Values Available						
2-Methylphenol (o-cresol)	6.97E+00	EPA 1997b	EqP	82	MIDEQ 2003	8500	Sabljic and Protic 1982
4-Methylphenol (p-cresol)	1.23E-02	EPA 1997b	EqP	25	MIDEQ 2003	49	Boyd 1982
Molybdenum	No Values Available						
Naphthalene	1.76E-01	MacDonald et al. 2000b	TEC	NA			
Nickel	2.27E+01	MacDonald et al. 2000b	TEC	NA			

216

Table B-4
Sediment ESLs for Aquatic Receptors

ECOI	Sediment ESL (mg/kg)	ESL Reference	Type	Water ESL (ug/L)	Water ESL Source	Koc	Koc Source
Nitrate	No Values Available						
Nitrite	No Values Available						
Pentachlorophenol	2.55E-01	EPA 1997b	EqP	6.7	MIDEQ 2003; pH dependant criterion (7.0 used)	3800	Delaune et al. 1983
Phenanthrene	2.04E-01	MacDonald et al. 2000b	TEC	NA			
Phenol	7.73E-01	EPA 1997b	EqP	2560	CDPHE 2002	30.2	Briggs 1981
Polyclorinated Biphenyls (Total)	4.00E-02	MacDonald et al. 2000a	TEC				
Pyrene	1.95E-01	MacDonald et al. 2000b	TEC	NA			
Selenium	9.50E-01	MacDonald et al. 1999	SQG	NA			
Silver	1.00E+00	Long et al. 1995	ERL	NA			
Strontium	No Values Available						
1,1,2,2-Tetrachloroethane	1.90E+00	EPA 1997b	EqP	2400	CDPHE 2002	79	Chiou et al. 1979
Tetrachloroethene	3.05E+00	EPA 1997b	EqP	840	CDPHE 2002	363	Karickhoff 1981
Thallium	No Values Available						
Tin	No Values Available						
Toluene	1.66E+00	EPA 1997b	EqP	1750	CDPHE 2002	95	Seip et al. 1986
1,2,4-Trichlorobenzene	4.29E-01	EPA 1997b	EqP	30	MIDEQ 2003	1430	Southworth and Keller 1986
1,1,1-Trichloroethane	1.59E-01	EPA 1997b	EqP	89	MIDEQ 2003	179	Chiou et al. 1979
Trichloroethene	2.28E+01	EPA 1997b	EqP	21900	CDPHE 2002	104	Seip et al. 1986
Trichlorofluoromethane	No Values Available						
Uranium (Total)	No Values Available						
Vanadium	No Values Available						
Vinyl chloride	No Values Available						
Xylene (total)	9.10E-02	EPA 1997b	EqP	35	MIDEQ 2003	260	Vowles and Mantoura 1987 ; P-Xylene Value
Zinc	1.21E+02	MacDonald et al. 2000b	TEC	NA			
1,2,3-Trichlorobenzene	5.86E-02	EPA 1997b	EqP	8.00E+00	CCME 2002	7.3E+02	EpiWin
1,2,4-Trimethylbenzene	1.22E-01	EPA 1997b	EqP	1.70E+01	MIDEQ 2003	7.2E+02	EpiWin
1,3,5-Trimethylbenzene	3.16E-01	EPA 1997b	EqP	4.50E+01	MIDEQ 2003	7.0E+02	EpiWin
1,3-Dichlorobenzene	1.22E-01	EPA 1997b	EqP	2.80E+01	MIDEQ 2003	4.3E+02	EpiWin
2,4,6-Trichlorophenol	5.93E-02	EPA 1997b	EqP	5.00E+00	MIDEQ 2003	1.2E+03	EpiWin
2-Butanone	8.42E-02	EPA 1997b	EqP	4.00E+04	MIDEQ 2003	2.8E-02	EpiWin
2-Chloroethyl vinyl ether	No Values Available						
2-Nitrophenol	No Values Available						
4 Bromofluorobenzene	No Values Available						
4-Bromophenyl-phenylether	1.66E-01	EPA 1997b	EqP	4.00E+00	CCME 2002	4.2E+03	EpiWin
4-Chlorotoluene	No Values Available						
Atrazine	1.68E-02	EPA 1997b	EqP	7.30E+00	MIDEQ 2003	2.3E+02	EpiWin
Benzyl Alcohol	1.35E-03	EPA 1997b	EqP	8.60E+00	ORNL	1.6E+01	EpiWin
Boron	No Values Available						

217

Table B-4
Sediment ESLs for Aquatic Receptors

ECOI	Sediment ESL (mg/kg)	ESL Reference	Type	Water ESL (ug/L)	Water ESL Source	Koc	Koc Source
Calcium	No Values Available						
Cerium	No Values Available						
Cesium	No Values Available						
Chloride	No Values Available						
Chlorodifluoromethane	No Values Available						
Chloroethane	No Values Available						
Chloromethane	No Values Available						
Dibromofluoromethane	No Values Available						
Dichlorodifluoromethane	No Values Available						
Dichlorofluoromethane	5.26E-02	EPA 1997b	EqP	1.50E+02	MIDEQ 2003	3.5E+01	EpiWin
Dieldrin	5.94E-03	EPA 1997b	EqP	5.60E-02	CDPHE 2003	1.1E+04	EpiWin
Dioxin (TEQ Total)	8.50E-06	CCME 2002	ISQG	NA			
Ethylbenzene	1.66E+01	EPA 1997b	EqP	3.20E+03	CDPHE 2003	5.2E+02	EpiWin
Isopropylbenzene	No Values Available						
n-butylbenzene	No Values Available						
n-propylbenzene	No Values Available						
ortho-phosphate	No Values Available						
Phosphorus	600	MacDonald et al. 1999	LEL	NA			
Potassium	No Values Available						
sec-butylbenzene	No Values Available						
Sodium	No Values Available						
Sulfate	No Values Available						
Sulfide	No Values Available						
Titanium	No Values Available						
trans-1,2-Dichloroethene	6.57E-01	EPA 1997b	EqP	1,500.00	MIDEQ 2003	4.4E+01	EpiWin

NOTE: The water ESLS used to calculate EqP-based ESLs are chronic values.
EpiWin - Part of Epi Suite, developed by EPA, Office Prevention Toxics and Syracuse Research Corporation, copywritght 2000, EPA.
Only ECOIs detected in sediments are listed.

218

Table B-5
Surface Water ESLs for Aquatic Receptors

ECOI	Acute (ug/L)	Chronic (ug/L)	Type of Benchmark (AWQC or Tier II)	Source Benchmark	Notes
Acenaphthylene	NA	NA			
Acetone	30000	1500	Tier II	DOE 1996c	
Aldrin	1.5	0.15	AWQC	CDPHE 2002; Chronic value estimated	Chronic = Acute/10
Aluminum	750	87	AWQC	CDPHE 2002	
Ammonium (as Ammonia)	77[1]	20	AWQC	CDPHE 2002	pH, temperature, life-stage dependent
Anthracene	13	0.73	Tier II	DOE 1996c	
Antimony	2300	240	Tier II	MIDEQ 2003	
Aroclor-1016	2	0.014	AWQC	CDPHE 2002	Value is for PCB (total)
Arsenic	340	150	AWQC	CDPHE 2002	chronic = total recoverable
Barium	2498	438	Tier II	MIDEQ 2003	hardness dependent, 100 mg/L
Benzene	5300	530	AWQC	CDPHE 2002; Chronic value estimated	Chronic = Acute/10
Benzo(a)anthracene	0.49	0.027	Tier II	DOE 1996c	
Benzo(a)pyrene	0.24	0.014	Tier II	DOE 1996c	
Benzo(b)fluoranthene	NA	NA			
Benzo(k)fluoranthene	NA	NA			
Benzoic Acid	740	42	Tier II	DOE 1996c	
Beryllium	43	2.4	Tier II	MIDEQ 2003	hardness dependent, 100 mg/L
alpha-BHC (Hexachlorocyclohexane, alpha)	39	2.2	Tier II	DOE 1996c	BHC (other) value used
beta-BHC (Hexachlorocyclohexane, beta)	39	2.2	Tier II	DOE 1996c	BHC (other) value used
gamma-BHC (Hexachlorocyclohexane, gamma)	0.95	0.08	AWQC	CDPHE 2002	
Bromodichloromethane	11000	1100	AWQC	CDPHE 2002; Chronic value estimated	Chronic = Acute/10
Bromoform	2300	320	Tier II	DOE 1996cc	
Bromomethane	640	35	Tier II	MIDEQ 2003	
2-Butanone	40000	2200	Tier II	MIDEQ 2003	
Butylbenzylphthalate	630	67	Tier II	MIDEQ 2003	
Cadmium	2	0.25	AWQC	EPA 2002	hardness dependent, 100 mg/L
Carbon Disulfide	17	0.92	Tier II	DOE 1996c	
Carbon tetrachloride	35200	3520	AWQC	CDPHE 2002; Chronic value estimated	Chronic = Acute/10
4-Chloroaniline	NA	NA			
Chlorobenzene	850	47	Tier II	MIDEQ 2003	
Chloroethane (ethyl chloride)	NA	NA			
Chloroform	28900	1240	AWQC	CDPHE 2002	
Chloromethane (methyl chloride)	NA	NA			
2-Chloronaphthalene	2,300	630	AWQC	CDPHE 2002	
Chrysene	NA	NA			
Cobalt	740	100	Tier II	MIDEQ 2003	
Copper	13	9	AWQC	CDPHE 2002	hardness dependent, 100 mg/L
Chromium III	570	74	AWQC	CDPHE 2002	hardness dependent, 100 mg/L
Cyanide	5	0.5	AWQC	CDPHE 2002; Chronic value estimated	Chronic = Acute/10; Expressed as free cyanide
4,4'-DDD	0.6	0.06	AWQC	CDPHE 2002; Chronic value estimated	Chronic = Acute/10
4,4'-DDE	1050	105	AWQC	CDPHE 2002; Chronic value estimated	Chronic = Acute/10
Dibenzofuran	72	4	Tier II	MIDEQ 2003	
Dibromochloromethane	NA	NA			
1,4-Dichlorobenzene	200	16	Tier II	MIDEQ 2003	
1,1-Dichloroethane	13000	740	Tier II	MIDEQ 2003	
1,2-Dichloroethane	118000	20000	AWQC	CDPHE 2002	
cis-1,2-Dichloroethene	11000	620	Tier II	MIDEQ 2003	
1,1-Dichloroethylene	2300	65	Tier II	MIDEQ 2003	
1,2-Dichloroethylene (total)	19000	1100	Tier II	MIDEQ 2003	
2,4-Dichlorophenol	2020	365	AWQC	CDPHE 2002	
1,2-Dichloropropane	23000	5700	AWQC	CDPHE 2002	
trans-1,3-Dichloropropene	6060	244	AWQC	CDPHE 2003	
Dieldrin	0.24	0.056	AWQC	CDPHE 2003	

Table B-5
Surface Water ESLs for Aquatic Receptors

ECOI	Acute (ug/L)	Chronic (ug/L)	Type of Benchmark (AWQC or Tier II)	Source Benchmark	Notes
Diethylphthalate	2000	110	Tier II	MIDEQ 2003	
2,4-Dimethylphenol	2120	212	AWQC	CDPHE 2002; Chronic value estimated	Chronic = Acute/10
Dimethylphthalate	NA	NA			
Di-n-butylphthalate	75	9.7	Tier II	MIDEQ 2003	
Di-n-octylphthalate	NA	NA			
Ethylbenzene	32000	3200	AWQC	CDPHE 2002; Chronic value estimated	Chronic = Acute/10
bis(2-ethylhexyl)phthalate	285	28.5	Tier II	MIDEQ 2003	Chronic = Acute/10
Fluoranthene	3980	398	AWQC	CDPHE 2002; Chronic value estimated	Chronic = Acute / 10
Fluorene	220	12	Tier II	MIDEQ 2003	
Fluoride (as fluorine)	10200	2120	Tier II	NY State 1998	hardness dependent, 100 mg/L
Heptachlor	0.52	0.0038	AWQC	CDPHE 2002	
Hexachlorobutadiene	90	9.3	AWQC	CDPHE 2002	
Hexachloroethane	980	540	AWQC	CDPHE 2002	
Indeno(1,2,3-cd)pyrene	NA	NA			
Iron	NA	1000	AWQC	CDPHE 2002	
Isophorone	9200	1300	Tier II	MIDEQ 2003	
Lead	65	2.5	AWQC	CDPHE 2002	hardness dependent, 100 mg/L
Lithium	1700	96	Tier II	MIDEQ 2003	
Manganese	2990	1650	AWQC	CDPHE 2002	hardness dependent, 100 mg/L
Mercury	1.4	0.77	AWQC	CDPHE 2002	
Methylene chloride	17000	940	Tier II	MIDEQ 2003	
2-Methylnaphthalene	NA	NA			
4-Methyl-2-pentanone	2200	170	Tier II	DOE 1996c	
2-Methylphenol (o-cresol)	150	82	Tier II	MIDEQ 2003	
4-Methylphenol (p-cresol)	450	25	Tier II	MIDEQ 2003	
Molybdenum	14000	800	Tier II	MIDEQ 2003	
Naphthalene	2300	620	AWQC	CDPHE 2002	
Nickel	468	52	AWQC	CDPHE 2002	hardness dependent, 100 mg/L
Nitrate	NA	NA			
Nitrite	8.95	4.43	AWQC	CDPHE 2002	calculated using non-salmonid formula and [Cl-] = 22 mg/l
Pentachlorophenol	17.4[2]	6.7[3]	AWQC	CDPHE 2002	
Phenanthrene	43	2.4	Tier II	MIDEQ 2003	
Phenol	10200	2560	AWQC	CDPHE 2002	
Pyrene	NA	0.025	CWQ	CCME 2002	
Selenium	18.4	4.6	AWQC	CDPHE 2002	
Silver	2	0.32	AWQC	CDPHE 2002	hardness dependent, 100 mg/L
Strontium	150000	8300	Tier II	MIDEQ 2003	
Styrene	2900	160	Tier II	MIDEQ 2003	
1,1,2,2-Tetrachloroethane	NA	2400	AWQC	CDPHE 2002	
Tetrachloroethene	5280	840	AWQC	CDPHE 2002	
Thallium	160	15	Tier II/AWQC	MIDEQ 2003/CDPHE 2002	
Tin	2700	73	Tier II	DOE 1996c	
Toluene	17500	1750	CDPHE 2002: Chronic value estimated	Chronic = Acute/10	
1,2,4-Trichlorobenzene	250	50	AWQC	CDPHE 2002	
1,1,1-Trichloroethane	1600	89	Tier II	MIDEQ 2003	
1,1,2-Trichloroethane	9400	940	AWQC	CDPHE 2002; Chronic value estimated	Chronic = Acute / 10
Trichloroethene	45000	21900	AWQC	CDPHE 2002	
Trichlorofluoromethane	NA	NA			
2,4,5-Trichlorophenol	NA	NA			
Uranium (total)	46.5	2.6	Tier II	DOE 1996c	
Vanadium	220	12	Tier II	MIDEQ 2003	
Vinyl chloride	17000	930	Tier II	MIDEQ 2003	

220

Table B-5
Surface Water ESLs for Aquatic Receptors

ECOI	Acute (ug/L)	Chronic (ug/L)	Type of Benchmark (AWQC or Tier II)	Source Benchmark	Notes
Xylene (total)	630	35	Tier II	MIDEQ 2003	
Zinc	117	118	AWQC	CDPHE 2002	hardness dependent, 100 mg/L
1,1,2-Trichloro-1,2,2-trifluoroethane	570	32	Tier II	MIDEQ 2003	
1,1-Dichloropropene	UT	UT			
1,2,3-Trichlorobenzene	UT	8	CWQ	CCME 2002	
1,2,3-Trichloropropane	UT	UT			
1,2,4-Trimethylbenzene	310	17	Tier II	MIDEQ 2003	
1,2-Dibromo-3-chloropropane	UT	UT			
1,2-Dichlorobenzene	240	13	Tier II	MIDEQ 2003	
1,3,5-Trimethylbenzene	810	45	Tier II	MIDEQ 2003	
1,3-Dichlorobenzene	200	28	Tier II	MIDEQ 2003	
2,4,6-Trichlorophenol	79	5	Tier II	MIDEQ 2003	
2-Chloroethyl vinyl ether	UT	UT			
2-Hexanone	1,800	99	Tier II	DOE 1996c	
2-Nitrophenol	UT	UT			
4,4'-DDT	0.55	0.001	AWQC	CDPHE 2002	
4-Bromofluorobenzene	UT	UT			
4-Bromophenyl-phenylether	UT	UT	AWQC	CCME 2002	
4-Chlorotoluene	UT	UT			
4-Isopropyltoluene	UT	UT			
Acenaphthene	1,700	520	AWQC	CDPHE 2002	
Alkalinity	UT	UT			
Ammonia	0.077	0.02	AWQC	CDPHE 2002	
Atraton	UT	UT			
Atrazine	100	7.3	Tier II	MIDEQ 2003	
Benzo(g,h,i)perylene	UT	UT			
Benzyl Alcohol	150	8.6	Tier II	DOE 1996c	
beta-Chlordane	UT	UT			
Bicarbonate	UT	UT			
bis(2-Chloroisopropyl) ether	UT	29	CWQ	CCME 2002	
Borón	31,000	1,900	Tier II	MIDEQ 2003	
Bromide	UT	UT			
Bromochloromethane	UT	UT			
Carbazole	72	4	Tier II	MIDEQ 2003	
Carbonate	UT	UT			
Cerium	UT	UT			
Cesium	UT	UT			
Chloride	860,000	230,000	AWQC	EPA 2002	
Chlorodifluoromethane	UT	UT			
cis-Chlordane	UT	UT			
Dalapon	UT	UT			
Decachlorobiphenyl	UT	UT			
delta-BHC	39	2.2	Tier II	DOE 1996c	Value for BHC Other used.
Dibenz(a,h)anthracene	UT	UT			
Dicamba	UT	10	CWQ	CCME 2002	
Dichlorodifluoromethane	UT	UT			

221

Table B-5
Surface Water ESLs for Aquatic Receptors

ECOI	Acute (ug/L)	Chronic (ug/L)	Type of Benchmark (AWQC or Tier II)	Source Benchmark	Notes
Dichlorofluoromethane	2,600	150	Tier II	MIDEQ 2003	
Dichloroprop	UT	UT			
Dimethoate	UT	UT			
Dinoseb	9.5	0.48	Tier II	MIDEQ 2003	
Endosulfan I	0.22	0.056	AWQC	EPA 2002	Value for alpha-endosulfan used.
Endrin	0.086	0.036	AWQC	CDPHE 2002	
Heptachlor epoxide	0.52	0.0038	AWQC	CDPHE 2002	
Isopropylbenzene	UT	UT			
Magnesium	UT	UT			
n-Butylbenzene	UT	UT			
Nitrite	8950	4470	AWQC	CDPHE 2002	Updated value, calc. using non-salmonid formula [Cl-] = 22 mg/L
N-Nitrosomorpholine	UT	UT			
n-Propylbenzene	UT	UT			
Ortho-phosphate	UT	UT			
PCB-1254	2	0.014	AWQC	CDPHE 2002	
PCB-1260	2	0.014	AWQC	CDPHE 2002	
Phosphate	UT	UT			
Phosphorus	UT	UT			
Potassium	UT	UT			
Prometon	UT	UT			
sec-Butylbenzene	UT	UT			
Silica	UT	UT			
Silicon	UT	UT			
Simazine	UT	10	CWQ	CCME 2002	
Sodium	UT	UT			
Sulfate	UT	UT			
Sulfide	UT	UT			
Titanium	UT	UT			
trans-1,2-Dichloroethene	28,000	1,500	Tier II	MIDEQ 2003	
Tritium	UT	UT			
Uranium	2402	1501	Tier II	CDPHE 2002	Updated value, hardness dependent = 100 mg/L

NOTES: NA = Not available; AWQC = Ambient Water Quality Criteria

Citations by priority
1) CDPHE 2002
2) EPA 2002
3) MIDEQ 2003
4) CCME 2002
5) DOE 1996c
6) NY State 1998

[1] The acute value for ammonium was calculated using the following assumptions: water temperature = 20^0 C, pH = 7.0. The equation for calculating this value is: 0.43/FT/FPH/2

[2] The acute criterion for pentachlorophenol was calculated as (exp(1.005*(pH)-4.869))*2; pH was assumed to be 7.0

[3] The chronic criteria for pentachlorophenol was calculated as exp(1.005*(pH)-5.134); pH was assumed to be 7.0.

222

Table B-7
Summary of ESLs for Terrestrial Vertebrate Receptors

ECOI	Mourning Dove - Herbivore NOAEL (mg/kg)	Mourning Dove - Herbivore Threshold (mg/kg)	Mourning Dove - Insectivore NOAEL (mg/kg)	Mourning Dove - Insectivore Threshold (mg/kg)	American Kestrel NOAEL (mg/kg)	American Kestrel Threshold (mg/kg)	Deer Mouse - Herbivore NOAEL (mg/kg)	Deer Mouse - Herbivore Threshold (mg/kg)	Deer Mouse - Insectivore NOAEL (mg/kg)	Deer Mouse - Insectivore Threshold (mg/kg)	Prairie Dog NOAEL (mg/kg)	Prairie Dog Threshold (mg/kg)	Mule Deer NOAEL (mg/kg)	Mule Deer Threshold (mg/kg)	Coyote - Carnivore NOAEL (mg/kg)	Coyote - Carnivore Threshold (mg/kg)	Coyote - Generalist NOAEL (mg/kg)	Coyote - Generalist Threshold (mg/kg)	Coyote - Insectivore NOAEL (mg/kg)	Coyote - Insectivore Threshold (mg/kg)	PMJM NOAEL (mg/kg)
Inorganic ECOIs																					
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	9.89E+00	NA	9.05E-01	NA	1.87E+01	NA	5.76E+01	NA	1.38E+02	NA	1.32E+01	NA	3.85E+00	NA	1.00E+00
Arsenic	2.00E+01	NA	1.64E+02	NA	1.03E+03	NA	2.57E+00	9.87E+00	5.14E+01	2.88E+02	9.35E+00	3.59E+01	1.30E+01	4.99E+01	7.09E+02	2.93E+03	3.41E+02	1.39E+03	2.93E+02	1.45E+03	2.21E+00
Barium	1.59E+02	2.22E+02	3.57E+02	5.06E+02	1.32E+03	1.86E+03	9.30E+02	NA	4.43E+03	NA	3.22E+03	NA	4.77E+03	NA	2.49E+04	NA	1.98E+04	NA	1.84E+04	NA	7.43E+02
Beryllium	NA	NA	NA	NA	NA	NA	1.60E+02	NA	6.82E+00	NA	2.11E+02	NA	8.96E+02	NA	1.07E+03	NA	1.03E+02	NA	2.92E+01	NA	8.16E+00
Boron	3.03E+01	NA	1.15E+02	NA	1.67E+02	NA	6.21E+01	NA	4.22E+02	NA	2.37E+02	NA	3.14E+02	NA	9.29E+02	NA	6.07E+03	NA	1.82E+03	NA	5.27E+01
Cadmium	2.81E+01	NA	7.05E-01	NA	1.50E+01	NA	5.99E+01	NA	1.56E+00	NA	1.98E+02	NA	7.23E+02	NA	1.36E+03	NA	5.12E+01	NA	9.75E+00	NA	1.75E+00
Chromium III	2.46E+01	NA	1.34E+00	NA	1.40E+01	NA	2.37E+05	NA	1.32E+04	NA	5.86E+05	NA	1.23E+06	NA	3.74E+06	NA	2.19E+05	NA	5.72E+04	NA	1.61E+04
Chromium VI	2.46E+01	NA	1.34E+00	NA	1.42E+01	NA	2.81E+02	NA	1.59E+01	NA	7.03E+02	NA	1.46E+03	NA	4.17E+03	NA	2.50E+02	NA	6.85E+01	NA	1.93E+01
Cobalt	2.78E+02	NA	8.70E+01	NA	4.40E+02	NA	1.48E+03	NA	3.63E+02	NA	2.46E+03	NA	7.90E+03	NA	3.78E+03	NA	2.49E+03	NA	1.52E+03	NA	3.40E+02
Copper	2.89E+01	NA	8.25E+00	NA	1.64E+02	NA	2.95E+02	NA	6.05E+02	NA	8.38E+02	NA	4.12E+03	NA	5.46E+03	NA	3.00E+03	NA	4.64E+03	NA	9.50E+01
Cyanide	NA	NA	NA	NA	NA	NA	6.07E+02	NA	1.04E+03	NA	2.20E+03	NA	3.07E+03	NA	4.46E+03	NA	4.23E+03	NA	4.41E+03	NA	3.81E+02
Fluoride	2.68E+01	NA	3.10E+01	NA	1.57E+02	NA	2.77E+02	NA	4.73E+02	NA	9.94E+02	NA	1.40E+03	NA	5.42E+03	NA	3.66E+03	NA	2.01E+03	NA	1.80E+02
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	4.99E+01	NA	1.21E+01	NA	9.58E+01	NA	1.34E+03	NA	2.42E+02	NA	1.85E+03	NA	9.80E+03	NA	8.93E+03	NA	3.07E+03	NA	1.39E+03	NA	2.20E+02
Lithium	NA	NA	NA	NA	NA	NA	1.88E+03	NA	6.10E+02	NA	3.18E+03	NA	1.02E+04	NA	1.84E+04	NA	5.61E+03	NA	2.56E+03	NA	5.19E+02
Manganese	1.03E+03	NA	2.63E+03	NA	9.92E+03	NA	4.86E+02	NA	4.08E+03	NA	1.52E+03	NA	2.51E+03	NA	1.41E+04	NA	1.09E+04	NA	1.91E+04	NA	3.88E+02
Mercury	1.97E-01	NA	1.00E-04	NA	1.57E+00	NA	4.39E-01	NA	1.79E-01	NA	3.15E+00	NA	7.56E+00	NA	8.18E+00	NA	8.49E+00	NA	3.73E+01	NA	5.21E-02
Molybdenum	4.44E+01	NA	6.97E+00	NA	7.67E+01	NA	8.68E+00	NA	1.90E+00	NA	2.71E+01	NA	4.43E+01	NA	2.75E+02	NA	2.89E+01	NA	8.18E+00	NA	1.84E+00
Nickel	4.41E+01	3.20E+02	1.24E+00	7.84E+00	1.31E+01	8.99E+01	1.64E+01	NA	4.31E-01	NA	3.83E+01	NA	1.24E+02	NA	9.09E+01	NA	6.02E+00	NA	1.86E+00	NA	5.10E-01
Nitrate	NA	NA	NA	NA	NA	NA	4.48E+03	NA	7.65E+03	NA	1.62E+04	NA	2.27E+04	NA	3.29E+04	NA	3.22E+04	NA	3.29E+04	NA	2.91E+03
Selenium	1.61E+00	NA	1.00E+00	NA	8.48E+00	NA	8.72E-01	NA	7.54E-01	NA	2.80E+00	NA	3.82E+00	NA	3.25E+01	NA	1.22E+01	NA	5.39E+00	NA	4.21E-01
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Strontium	NA	NA	NA	NA	NA	NA	9.40E+02	NA	1.36E+04	NA	3.52E+03	NA	4.70E+03	NA	5.84E+05	NA	1.45E+05	NA	5.73E+04	NA	8.33E+02
Thallium	NA	NA	NA	NA	NA	NA	1.80E+02	3.12E+02	7.24E+00	1.25E+01	2.04E+02	3.50E+02	1.04E+03	1.80E+03	2.12E+02	3.66E+02	8.16E+01	1.40E+02	3.08E+01	5.33E+01	8.64E+00
Tin	2.61E+01	NA	2.90E+00	NA	1.90E+01	NA	4.50E+01	NA	3.77E+00	NA	8.06E+01	NA	2.42E+02	NA	7.00E+01	NA	3.61E+01	NA	1.62E+01	NA	4.22E+00
Titanium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium	6.85E+02	NA	4.46E+02	NA	2.79E+03	NA	9.70E+02	NA	5.69E+02	NA	1.23E+03	NA	5.47E+03	NA	7.30E+03	NA	3.11E+03	NA	2.27E+03	NA	3.70E+02
Vanadium	5.03E+02	NA	2.74E+02	NA	1.51E+03	NA	6.37E+01	NA	2.99E+01	NA	8.35E+01	NA	3.58E+02	NA	3.41E+02	NA	1.64E+02	NA	1.21E+02	NA	2.16E+01
Zinc	1.09E+02	NA	6.46E-01	NA	1.13E+02	NA	1.71E+02	NA	5.29E+00	NA	1.17E+03	NA	2.77E+03	NA	1.65E+04	NA	3.89E+03	NA	4.31E+02	NA	6.41E+00
Organic ECOIs																					
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	1.38E+04	NA	5.51E+02	NA	4.85E+04	NA	6.99E+04	NA	2.35E+03	NA	2.35E+03	NA	2.39E+03	NA	6.66E+02
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	1.32E+03	NA	6.07E+01	NA	4.70E+03	NA	6.70E+03	NA	2.53E+02	NA	2.55E+02	NA	2.63E+02	NA	7.28E-01
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	6.02E+01	NA	3.12E+00	NA	2.15E+02	NA	3.05E+02	NA	1.28E+01	NA	1.30E+01	NA	1.35E+01	NA	3.71E+00
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	3.61E+02	NA	1.69E+01	NA	1.28E+03	NA	1.83E+03	NA	7.03E+01	NA	7.10E+01	NA	7.33E+01	NA	2.02E+01
1,2,3-Trichloropropane	NA	NA	NA	NA	NA	NA	3.30E+02	NA	1.39E+01	NA	1.17E+03	NA	1.67E+03	NA	5.86E+01	NA	5.90E+01	NA	6.01E+01	NA	1.67E+01
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	8.53E+01	NA	2.76E+00	NA	6.63E+00	NA	5.61E+02	NA	2.85E+01	NA	2.00E+03	NA	2.84E+03	NA	1.17E+02	NA	1.19E+02	NA	1.23E+02	NA	3.40E+01
1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	5.26E+02	NA	2.56E+01	NA	1.87E+03	NA	2.66E+03	NA	1.06E+02	NA	1.07E+02	NA	1.11E+02	NA	3.06E+01
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	1.11E+03	1.57E+03	4.99E+01	7.08E+01	3.92E+03	5.56E+03	5.60E+03	7.94E+03	2.09E+02	2.96E+02	2.10E+02	2.98E+02	2.16E+02	3.07E+02	5.99E+01
1,3,5-Trimethylbenzene	NA	NA	NA	NA	NA	NA	2.48E+02	NA	7.60E+00	NA	8.56E+02	NA	1.26E+03	NA	3.35E+01	NA	3.34E+01	NA	3.29E+01	NA	9.29E+00
1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	6.27E+01	NA	2.80E+00	NA	2.22E+02	NA	3.18E+02	NA	1.17E+01	NA	1.18E+01	NA	1.21E+01	NA	3.36E+00
1,3-Isobenzofurnadione	NA	NA	NA	NA	NA	NA	9.00E+03	NA	4.28E+02	NA	3.20E+04	NA	4.56E+04	NA	1.78E+03	NA	1.79E+03	NA	1.85E+03	NA	5.12E+02
1,4 Dioxane	NA	NA	NA	NA	NA	NA	1.96E+02	NA	1.84E+01	NA	7.19E+02	NA	9.90E+02	NA	6.85E+01	NA	7.09E+01	NA	7.95E+01	NA	2.07E+01
1,4-Dichlorobenzene (p)	NA	NA	NA	NA	NA	NA	1.71E+03	2.41E+03	5.76E+01	8.15E+01	5.93E+03	8.39E+03	8.65E+03	1.22E+04	2.51E+02	3.55E+02	2.51E+02	3.54E+02	2.50E+02	3.53E+02	7.02E+01
1-Methyl napthalene	NA	NA	NA	NA	NA	NA	2.48E+02	NA	7.41E+00	NA	8.54E+02	NA	1.26E+03	NA	3.28E+01	NA	3.26E+01	NA	3.21E+01	NA	9.07E+00
2,3,4,6 Tetrachlorophenol	NA	NA	NA	NA	NA	NA	1.94E+02	NA	5.22E+00	NA	6.61E+02	NA	9.84E+02	NA	2.34E+01	NA	2.32E+01	NA	2.26E+01	NA	6.41E+00
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenoxy Acetic Acid	NA	NA	NA	NA	NA	NA	4.76E+00	8.73E+00	1.62E-01	2.96E-01	1.66E+01	3.04E+01	2.41E+01	4.43E+01	7.04E-01	1.29E+00	7.03E-01	1.29E+00	7.01E-01	1.28E+00	1.97E-01
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	4.98E+00	NA	1.61E-01	NA	1.73E+01	NA	2.53E+01	NA	7.04E-01	NA	7.01E-01	NA	6.95E-01	NA	1.96E-01
2,4,6-Trinitrotoluene	NA	NA	NA	NA	NA	NA	5.83E+00	NA	2.83E-01	NA	2.08E+01	NA	2.95E+01	NA	1.17E+00	NA	1.18E+00	NA	1.23E+00	NA	3.38E-01
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	7.10E+01	NA	2.74E+00	NA	2.49E+02	NA	3.60E+02	NA	1.17E+01	NA	1.18E+01	NA	1.19E+01	NA	3.32E+00
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	1.37E+03	NA	7.15E+01	NA	4.90E+03	NA	6.93E+03	NA	2.93E+02	NA	2.97E+02	NA	3.10E+02	NA	8.51E-01
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	6.96E-01	NA	3.21E-02	NA	2.47E+00	NA	3.53E+00	NA	1.34E-01	NA	1.35E-01	NA	1.39E-01	NA	3.84E-02
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	1.34E+02	NA	6.19E+00	NA	4.77E+02	NA	6.81E+02	NA	2.58E+01	NA	2.60E+01	NA	2.68E+01	NA	7.41E+00
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	6.08E+00	NA	2.81E-01	NA	2.16E+01	NA	3.08E+01	NA	1.17E+00	NA	1.18E+00	NA	1.22E+00	NA	3.37E-01
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	9.27E+01	1.35E+02	2.77E+00	4.03E+00	3.19E+02	4.64E+02	4.71E+02	6.85E+02	1.23E+01	1.78E+01	1.22E+01	1.77E+01	1.20E+01	1.75E+01	3.39E+00
2-Methylphenol	NA	NA	NA	NA	NA	NA	2.60E+03	NA	1.24E+02	NA	9.26E+03	NA	1.32E+04	NA	5.14E+02	NA	5.19E+02	NA	5.36E+02	NA	1.48E+02
2-Nitroaniline	NA	NA	NA	NA	NA	NA	1.17E+02	NA	5.66E+00	NA	4.18E+02	NA	5.95E+02	NA	2.34E+01	NA	2.37E+01	NA	2.45E+01	NA	6.76E+00
3,3-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-(2,4-Dichlorophenoxy) Butyric Acid	NA	NA	NA	NA	NA	NA	1.38E+01	NA	4.26E-01	NA	4.76E+01	NA	6.99E+01	NA	1.88E+00	NA	1.87E+00	NA	1.84E+00	NA	5.20E-01
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	1.25E+01	NA	5.60E-01	NA	4.43E+01	NA	6.32E+01	NA	2.35E+00	NA	2.36E+00	NA	2.43E+00	NA	6.73E-01
4-Chloroaniline	NA	NA	NA	NA	NA	NA	1.36E+01	NA	7.16E-01	NA	4.89E+01	NA	6.91E+01	NA	2.93E+00	NA	2.97E+00	NA	3.10E+00	NA	8.51E-01
4-Methyl-2-Pentanone	NA	NA	NA	NA	NA	NA	2.38E+02	NA	1.46E+01	NA	8.59E+02	NA	1.20E+03	NA	5.84E+01	NA	5.96E+01	NA	6.34E+01	NA	1.72E+01
4-Methylphenol (p-cresol)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	7.29E+02	NA	4.10E+01	NA	2.62E+03	NA	3.69E+03	NA	1.66E+02	NA	1.69E+02	NA	1.78E+02	NA	4.86E+01
4-Nitrophenol	NA	NA	NA	NA	NA	NA	2.86E+02	NA	1.42E+01	NA	1.02E+03	NA	1.45E+03	NA	5.86E+01	NA	5.93E+01	NA	6.15E+01	NA	1.69E+01
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	6.75E+01	1.51E+02	6.18E+00	1.38E+01	2.48E+02	5.54E+02	3.41E+02	7.63E+02	2.32E+01	5.18E+01	2.40E+01	5.36E+01	2.68E+01	5.99E+01	7.00E+00
Aldrin	NA	NA	NA	NA	NA	NA	3.62E+00	NA	4.70E-02	NA	1.13E+01	NA	1.85E+01	NA	2.33E-01	NA	2.25E-01	NA	2.04E-01	NA	5.89E-02
alpha-BHC	NA	NA	NA	NA	NA	NA	7.26E+02	NA	1.87E+01	NA	2.47E+03	NA	3.69E+03	NA	8.44E+01	NA	8.34E+01	NA	8.08E+01	NA	2.30E+01
Ammonium (as Ammonia)	NA	NA	NA	NA	NA	NA	7.32E+03	NA	5.86E+02	NA	2.67E+04	NA	3.70E+04	NA	2.25E+03	NA	2.31E+03	NA	2.54E+03	NA	6.73E+02
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1016[1]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221[1]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table B-6
ESLs for Terrestrial Invertebrates and Plants

ECOI	Terrestrial Invertebrate (mg/kg)	Terrestrial Plant (mg/kg)	Invertebrate Value Source	Plant Value Source
Acenaphthene	NA	20		Efroymson et al. 1997b
Acenaphthylene	NA	NA		
Acetone	NA	NA		
Aldrin	NA	NA		
Aluminum	NA	50		Efroymson et al. 1997b
Ammonium (as Ammonia)	NA	NA		
Anthracene	NA	NA		
Antimony	78	5	EPA 2003a	Efroymson et al. 1997b
Aroclor 1016	NA	40 (PCBs)		Efroymson et al. 1997b
Aroclor 1221	NA	40 (PCBs)		Efroymson et al. 1997b
Aroclor 1232	NA	40 (PCBs)		Efroymson et al. 1997b
Aroclor 1242	NA	40 (PCBs)		Efroymson et al. 1997b
Aroclor 1248	NA	40 (PCBs)		Efroymson et al. 1997b
Aroclor 1254	NA	40 (PCBs)		Efroymson et al. 1997b
Aroclor 1260	NA	40 (PCBs)		Efroymson et al. 1997b
Arsenic	60	10	Efroymson et al. 1997a	Efroymson et al. 1997b
Barium	330	500	EPA 2003a	Efroymson et al. 1997b
Benzene	NA	0.5		CCME, 1999
Benzene, 1,2,4-Trimethyl	NA	NA		
Benzene, 1,3,5-Trimethyl	NA	NA		
Benzo(a)anthracene	NA	NA		
Benzo(a)pyrene	NA	NA		
Benzo(b)fluoranthene	NA	NA		
Benzo(g,h,i)perylene	NA	NA		
Benzo(k)fluoranthene	NA	NA		
Benzoic Acid	NA	NA		
Benzyl Alcohol	NA	NA		
Beryllium	40	10	EPA 2003a	Efroymson et al. 1997b
alpha-BHC (Hexachlorocyclohexane, alpha)	NA	NA		
beta-BHC (Hexachlorocyclohexane, beta)	NA	NA		
gamma-BHC (Hexachlorocyclohexane, gamma)	NA	NA		
Boron	NA	0.5		Efroymson et al. 1997b
Bromodichloromethane	NA	NA		
Bromoform	NA	NA		
Bromomethane (methyl bromide)	NA	NA		
4-Bromophenyl phenyl ether	NA	NA		
2-Butanone	NA	NA		
Butylbenzylphthalate	NA	NA		
Cadmium	140	32	EPA 2003a	EPA 2003a
Carbazole	NA	NA		
Carbon disulfide	NA	NA		
Carbon tetrachloride	NA	NA		
alpha-Chlordane	NA	NA		

223

Table B-6
ESLs for Terrestrial Invertebrates and Plants

ECOI	Terrestrial Invertebrate (mg/kg)	Terrestrial Plant (mg/kg)	Invertebrate Value Source	Plant Value Source
beta-Chlordane	NA	NA		
gamma-Chlordane	NA	NA		
4-Chloroaniline	30	20	Efroymson et al. 1997a	Efroymson et al. 1997b
Chlorobenzene	40	NA	Efroymson et al. 1997a	
Chloroethane (ethyl chloride)	NA	NA		
bis(2-chloroethyl)ether	NA	NA		
Chloroform	NA	NA		
bis(2-chloroisopropyl)ether	NA	NA		
Chloromethane (methyl chloride)	NA	NA		
2-Chloronaphthalene	NA	NA		
2-Chlorophenol	10	7	Efroymson et al. 1997a	Efroymson et al. 1997b
Chromium	0.4	1	Efroymson et al. 1997a	Efroymson et al. 1997b
Chromium III	NA	NA		
Chromium VI	NA	NA		
Chrysene	NA	NA		
Cobalt	NA	13		EPA 2003a
Copper	50	100	Efroymson et al. 1997a	Efroymson et al. 1997b
Cyanide	NA	NA		
4,4-DDD	NA	NA		
4,4-DDE	NA	NA		
4,4-DDT	NA	NA		
Dibenz(a,h)anthracene	NA	NA		
Dibenzofuran	NA	NA		
Dibromochloromethane	NA	NA		
1,2-Dichlorobenzene (o-)	NA	NA		
1,4-Dichlorobenzene (p-)	20	NA	Efroymson et al. 1997a	
3,3-Dichlorobenzidine	NA	NA		
1,1-Dichloroethane	NA	NA		
1,2-Dichloroethane	NA	NA		
1,1-Dichloroethene	NA	NA		
1,2-Dichloroethene (total)	NA	NA		
2,4-Dichlorophenol	20	20	Efroymson et al. 1997a	Efroymson et al. 1997b
1,2-Dichloropropane	700	NA	Efroymson et al. 1997a	
cis-1,3-Dichloropropene	NA	NA		
trans-1,3-Dichloropropene	NA	NA		
Dieldrin	NA	NA		
Diethylphthalate	NA	100		Efroymson et al. 1997b
1,2-Dimethylbenzene	NA	NA		
2,4-Dimethylphenol	NA	NA		
Dimethylphthalate	200	NA	Efroymson et al. 1997a	
Di-n-butylphthalate	NA	200		Efroymson et al. 1997b
4,6-Dinitro-2-methylphenol	NA	NA		
2,4-Dinitrophenol	NA	20	Efroymson et al. 1997a	Efroymson et al. 1997b
2,4-Dinitrotoluene	NA	NA		
2,6-Dinitrotoluene	NA	NA		
Di-n-octylphthalate	NA	NA		
Endosulfan I	NA	NA		

224

Table B-6
ESLs for Terrestrial Invertebrates and Plants

ECOI	Terrestrial Invertebrate (mg/kg)	Terrestrial Plant (mg/kg)	Invertebrate Value Source	Plant Value Source
Endosulfan II	NA	NA		
Endosulfan (technical)	NA	NA		
Endosulfan sulfate	NA	NA		
Endrin	NA	NA		
Ethylbenzene	NA	NA		
bis(2-ethylhexyl)phthalate	NA	NA		
Fluoranthene	NA	NA		
Fluorene	30	200	Efroymson et al. 1997a	Efroymson et al. 1997b
Fluoride (as fluorine)	NA	NA		
Furan	NA	600		Efroymson et al. 1997b
Heptachlor	NA	NA		
Heptachlor epoxide	NA	NA		
Hexachlorobenzene	NA	NA		
Hexachlorobutadiene	NA	NA		
Hexachlorocyclopentadiene	NA	10		Efroymson et al. 1997b
Hexachloroethane	NA	NA		
Indeno(1,2,3-cd)pyrene	NA	NA		
Iron	NA	NA		Efroymson et al. 1997b
Isophorone	NA	NA		
4-Isopropyltoluene	NA	NA		
Lead	1700	110	EPA 2003a	EPA 2003a
Lithium	NA	2		Efroymson et al. 1997b
Manganese	NA	500		Efroymson et al. 1997b
Mercury	0.1	0.3	Efroymson et al. 1997a	Efroymson et al. 1997b
Methoxychlor	NA	NA		
Methylene chloride	NA	NA		
1-Methylnaphthalene	NA	NA		
2-Methylnaphthalene	NA	NA		
4-Methyl-2-pentanone	NA	NA		
2-Methylphenol (o-cresol)	NA	NA		
4-Methylphenol (p-cresol)	NA	NA		
Molybdenum	NA	2		Efroymson et al. 1997b
Naphthalene	NA	NA		
Nickel	200	30	Efroymson et al. 1997a	Efroymson et al. 1997b
Nitrate	NA	NA		
Nitrite	NA	NA		
2-Nitroaniline	NA	NA		
Nitrobenzene	40	NA	Efroymson et al. 1997a	
4-Nitrophenol	7	NA	Efroymson et al. 1997a	
n-Nitrosodiphenylamine	20	NA	Efroymson et al. 1997a	
n-Nitrosodipropylamine	NA	NA		
Pendimethalin	NA	NA		
Pentachlorobenzene	20	NA	Efroymson et al. 1997a	
Pentachloronitrobenzene	NA	NA		
Pentachlorophenol	6	3	Efroymson et al. 1997a	Efroymson et al. 1997b
Phenanthrene	NA	NA		
Phenol	30	70	Efroymson et al. 1997a	Efroymson et al. 1997b

225

Table B-6
ESLs for Terrestrial Invertebrates and Plants

ECOI	Terrestrial Invertebrate (mg/kg)	Terrestrial Plant (mg/kg)	Invertebrate Value Source	Plant Value Source
Pyrene	NA	NA		
Selenium	70	1	Efroymson et al. 1997a	Efroymson et al. 1997b
Silver	NA	2		Efroymson et al. 1997b
Strontium	NA	NA		
Styrene	NA	300		Efroymson et al. 1997b
1,2,4,5-Tetrachlorobenzene	10	NA	Efroymson et al. 1997a	
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	NA	NA		
1,1,2,2-Tetrachloroethane	NA	NA		
Tetrachloroethene	NA	NA		
Thallium	NA	1		Efroymson et al. 1997b
Tin	NA	50		Efroymson et al. 1997b
Titanium	NA	NA		Efroymson et al. 1997b
Toluene	NA	200		Efroymson et al. 1997b
Toxaphene	NA	NA		
1,2,4-Trichlorobenzene	20	NA	Efroymson et al. 1997a	
1,1,1-Trichloroethane	NA	NA		
1,1,2-Trichloroethane	NA	NA		
Trichloroethene	NA	NA		
Trichlorofluoromethane	NA	NA		
2,4,5-Trichlorophenol	9	4	Efroymson et al. 1997a	Efroymson et al. 1997b
2,4,6-Trichlorophenol	10	4	Efroymson et al. 1997a	Efroymson et al. 1997b
Trifluralin	NA	NA		
Uranium (Total)	NA	5		Efroymson et al. 1997b
Vanadium	NA	2		Efroymson et al. 1997b
Vinyl acetate	NA	NA		
Vinyl chloride	NA	NA		
Xylene (total)	NA	NA		
Zinc	200	50	Efroymson et al. 1997a	Efroymson et al. 1997b

NA = Not available

226

Table B-7
Summary of ESLs for Terrestrial Vertebrate Receptors

ECOI	Mourning Dove - Herbivore		Mourning Dove - Insectivore		American Kestrel		Deer Mouse - Herbivore		Deer Mouse - Insectivore		Prarie Dog		Mule Deer		Coyote - Carnivore		Coyote - Generalist		Coyote - Insectivore		PMJM
	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)
Inorganic ECOIs																					
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	9.89E+00	NA	9.05E-01	NA	1.87E+01	NA	5.76E+01	NA	1.38E+02	NA	1.32E+01	NA	3.85E+00	NA	1.00E+00
Arsenic	2.00E+01	NA	1.64E+02	NA	1.03E+03	NA	2.57E+00	9.87E+00	5.14E+01	2.88E+02	9.35E+00	3.59E+01	1.30E+01	4.99E+01	7.09E+02	2.93E+03	3.41E+02	1.39E+03	2.93E+02	1.45E+03	2.21E+00
Barium	1.59E+02	2.22E+02	3.57E+02	5.06E+02	1.32E+03	1.86E+03	9.30E+02	NA	4.43E+03	NA	3.22E+03	NA	4.77E+03	NA	2.49E+04	NA	1.98E+04	NA	1.84E+04	NA	7.43E+02
Beryllium	NA	NA	NA	NA	NA	NA	1.60E+02	NA	6.82E+00	NA	2.11E+02	NA	8.96E+02	NA	1.07E+03	NA	1.03E+02	NA	2.92E+01	NA	8.16E+00
Boron	3.03E+01	NA	1.15E+02	NA	1.67E+02	NA	6.21E+01	NA	4.22E+02	NA	2.37E+02	NA	3.14E+02	NA	9.29E+02	NA	6.07E+03	NA	1.82E+03	NA	5.27E+01
Cadmium	2.81E+01	NA	7.05E-01	NA	1.50E+01	NA	5.99E+01	NA	1.56E+00	NA	1.98E+02	NA	7.23E+02	NA	1.36E+03	NA	5.12E+01	NA	9.75E+00	NA	1.75E+00
Chromium III	2.46E+01	NA	1.34E+00	NA	1.40E+01	NA	2.37E+05	NA	1.32E+04	NA	5.86E+05	NA	1.23E+06	NA	5.74E+06	NA	2.19E+05	NA	5.72E+04	NA	1.61E+04
Chromium VI	2.46E+01	NA	1.34E+00	NA	1.42E+01	NA	2.81E+02	NA	1.59E+01	NA	7.03E+02	NA	1.46E+03	NA	4.17E+03	NA	2.50E+02	NA	6.85E+01	NA	1.93E+01
Cobalt	2.78E+02	NA	8.70E+01	NA	4.40E+02	NA	1.48E+03	NA	3.63E+02	NA	2.46E+03	NA	7.90E+03	NA	3.78E+03	NA	2.49E+03	NA	1.52E+03	NA	3.40E+02
Copper	2.89E+01	NA	8.25E+00	NA	1.64E+02	NA	2.95E+02	NA	6.05E+02	NA	8.38E+02	NA	4.12E+03	NA	5.46E+03	NA	3.00E+03	NA	4.64E+03	NA	9.50E+01
Cyanide	NA	NA	NA	NA	NA	NA	6.07E+02	NA	1.04E+03	NA	2.20E+03	NA	3.07E+03	NA	4.46E+03	NA	4.23E+03	NA	4.41E+03	NA	3.81E+02
Fluoride	2.68E+01	NA	3.10E+01	NA	1.57E+02	NA	2.77E+02	NA	4.73E+02	NA	9.94E+02	NA	1.40E+03	NA	5.42E+03	NA	3.66E+03	NA	2.01E+03	NA	1.80E+02
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	4.99E+01	NA	1.21E+01	NA	9.58E+01	NA	1.34E+03	NA	2.42E+02	NA	1.85E+03	NA	9.80E+03	NA	8.93E+03	NA	3.07E+03	NA	1.39E+03	NA	2.20E+02
Lithium	NA	NA	NA	NA	NA	NA	1.88E+03	NA	6.10E+02	NA	3.18E+03	NA	1.02E+04	NA	1.84E+04	NA	5.61E+03	NA	2.56E+03	NA	5.19E+02
Manganese	1.03E+03	NA	2.63E+03	NA	9.92E+03	NA	4.86E+02	NA	4.08E+03	NA	1.52E+03	NA	2.51E+03	NA	1.41E+04	NA	1.09E+04	NA	1.91E+04	NA	3.88E+02
Mercury	1.97E-01	NA	1.00E-04	NA	1.57E+00	NA	4.39E-01	NA	1.79E-01	NA	3.15E+00	NA	7.56E+00	NA	8.18E+00	NA	8.49E+00	NA	3.73E+01	NA	5.21E-02
Molybdenum	4.44E+01	NA	6.97E+00	NA	7.67E+01	NA	8.68E+00	NA	1.90E+00	NA	2.71E+01	NA	4.43E+01	NA	2.75E+02	NA	2.89E+01	NA	8.18E+00	NA	1.84E+00
Nickel	4.41E+01	3.20E+02	1.24E+00	7.84E+00	1.31E+01	8.99E+01	1.64E+01	NA	4.31E-01	NA	3.83E+01	NA	1.24E+02	NA	9.09E+01	NA	6.02E+00	NA	1.86E+00	NA	5.10E-01
Nitrate	NA	NA	NA	NA	NA	NA	4.48E+03	NA	7.65E+03	NA	1.62E+04	NA	2.27E+04	NA	3.29E+04	NA	3.22E+04	NA	3.29E+04	NA	2.91E+03
Selenium	1.61E+00	NA	1.00E+00	NA	8.48E+00	NA	8.72E-01	NA	7.54E-01	NA	2.80E+00	NA	3.82E+00	NA	3.25E+01	NA	1.22E+01	NA	5.39E+00	NA	4.21E-01
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Strontium	NA	NA	NA	NA	NA	NA	9.40E+02	NA	1.36E+04	NA	3.52E+03	NA	4.70E+03	NA	5.84E+05	NA	1.45E+05	NA	5.73E+04	NA	8.33E+02
Thallium	NA	NA	NA	NA	NA	NA	1.80E+02	3.12E+02	7.24E+00	1.25E+01	2.04E+02	3.50E+02	1.04E+03	1.80E+03	2.12E+02	3.66E+02	8.16E+01	1.40E+02	3.08E+01	5.33E+01	8.64E+00
Tin	2.61E+01	NA	2.90E+00	NA	1.90E+01	NA	4.50E+01	NA	3.77E+00	NA	8.06E+01	NA	2.42E+02	NA	7.00E+01	NA	3.61E+01	NA	1.62E+01	NA	4.22E+00
Titanium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium	6.85E+02	NA	4.46E+02	NA	2.79E+03	NA	9.70E+02	NA	5.69E+02	NA	1.23E+03	NA	5.47E+03	NA	7.30E+03	NA	3.11E+03	NA	2.27E+03	NA	3.70E+02
Vanadium	5.03E+02	NA	2.74E+02	NA	1.51E+03	NA	6.37E+01	NA	2.99E+01	NA	8.35E+01	NA	3.58E+02	NA	3.41E+02	NA	1.64E+02	NA	1.21E+02	NA	2.16E+01
Zinc	1.09E+02	NA	6.46E-01	NA	1.13E+02	NA	1.71E+02	NA	5.29E+00	NA	1.17E+03	NA	2.77E+03	NA	1.65E+04	NA	3.89E+03	NA	4.31E+02	NA	6.41E+00
Organic ECOIs																					
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	1.38E+04	NA	5.51E+02	NA	4.85E+04	NA	6.99E+04	NA	2.35E+03	NA	2.35E+03	NA	2.39E+03	NA	6.66E+02
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	1.32E+03	NA	6.07E+01	NA	4.70E+03	NA	6.70E+03	NA	2.53E+02	NA	2.55E+02	NA	2.63E+02	NA	7.28E+01
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	6.02E+01	NA	3.12E+00	NA	2.15E+02	NA	3.05E+02	NA	1.28E+01	NA	1.30E+01	NA	1.35E+01	NA	3.71E+00
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	3.61E+02	NA	1.69E+01	NA	1.28E+03	NA	1.83E+03	NA	7.03E+01	NA	7.10E+01	NA	7.33E+01	NA	2.02E+01
1,2,3-Trichloropropane	NA	NA	NA	NA	NA	NA	3.30E+02	NA	1.39E+01	NA	1.17E+03	NA	1.67E+03	NA	5.86E+01	NA	5.90E+01	NA	6.01E+01	NA	1.67E+01
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	8.53E+01	NA	2.76E+00	NA	6.63E+00	NA	5.61E+02	NA	2.85E+01	NA	2.00E+03	NA	2.84E+03	NA	1.17E+02	NA	1.19E+02	NA	1.23E+02	NA	3.40E+01
1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	5.26E+02	NA	2.56E+01	NA	1.87E+03	NA	2.66E+03	NA	1.06E+02	NA	1.07E+02	NA	1.11E+02	NA	3.06E+01
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	1.11E+03	1.57E+03	4.99E+01	7.08E+01	3.92E+03	5.56E+03	5.60E+03	7.94E+03	2.09E+02	2.96E+02	2.10E+02	2.98E+02	2.16E+02	3.07E+02	5.99E+01
1,3,5-Trimethylbenzene	NA	NA	NA	NA	NA	NA	2.48E+02	NA	7.60E+00	NA	8.56E+02	NA	1.26E+03	NA	3.35E+01	NA	3.34E+01	NA	3.29E+01	NA	9.29E+00
1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	6.27E+01	NA	2.80E+00	NA	2.22E+02	NA	3.18E+02	NA	1.17E+01	NA	1.18E+01	NA	1.21E+01	NA	3.36E+00
1,3-Isobenzofurnadione	NA	NA	NA	NA	NA	NA	9.00E+03	NA	4.28E+02	NA	3.20E+04	NA	4.56E+04	NA	1.78E+03	NA	1.79E+03	NA	1.85E+03	NA	5.12E+02
1,4 Dioxane	NA	NA	NA	NA	NA	NA	1.96E+02	NA	1.84E+01	NA	7.19E+02	NA	9.90E+02	NA	6.85E+01	NA	7.09E+01	NA	7.95E+01	NA	2.07E+01
1,4-Dichlorobenzene (-p)	NA	NA	NA	NA	NA	NA	1.71E+03	2.41E+03	5.76E+01	8.15E+01	5.93E+03	8.39E+03	8.65E+03	1.22E+04	2.51E+02	3.55E+02	2.51E+02	3.54E+02	2.50E+02	3.53E+02	7.02E+01
1-Methyl napthalene	NA	NA	NA	NA	NA	NA	2.48E+02	NA	7.41E+00	NA	8.54E+02	NA	1.26E+03	NA	3.28E+01	NA	3.26E+01	NA	3.21E+01	NA	9.07E+00
2,3,4,6 Tetrachlorophenol	NA	NA	NA	NA	NA	NA	1.94E+02	NA	5.22E+00	NA	6.61E+02	NA	9.84E+02	NA	2.34E+01	NA	2.32E+01	NA	2.26E+01	NA	6.41E+00
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenoxy Acetic Acid	NA	NA	NA	NA	NA	NA	4.76E+00	8.73E+00	1.62E-01	2.96E-01	1.66E+01	3.04E+01	2.41E+01	4.43E+01	7.04E-01	1.29E+00	7.03E-01	1.29E+00	7.01E-01	1.28E+00	1.97E-01
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	4.98E+00	NA	1.61E-01	NA	1.73E+01	NA	2.53E+01	NA	7.04E-01	NA	7.01E-01	NA	6.95E-01	NA	1.96E-01
2,4,6-Trinitrotoluene	NA	NA	NA	NA	NA	NA	5.83E+00	NA	2.83E-01	NA	2.08E+01	NA	2.95E+01	NA	1.17E+00	NA	1.18E+00	NA	1.23E+00	NA	3.38E-01
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	7.10E+01	NA	2.74E+00	NA	2.49E+02	NA	3.60E+02	NA	1.17E+01	NA	1.18E+01	NA	1.19E+01	NA	3.32E+00
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	1.37E+03	NA	7.15E+01	NA	4.90E+03	NA	6.93E+03	NA	2.93E+02	NA	2.97E+02	NA	3.10E+02	NA	8.51E+01
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	6.96E-01	NA	3.21E-02	NA	2.47E+00	NA	3.53E+00	NA	1.34E-01	NA	1.35E-01	NA	1.39E-01	NA	3.84E-02
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	1.34E+02	NA	6.19E+00	NA	4.77E+02	NA	6.81E+02	NA	2.58E+01	NA	2.60E+01	NA	2.68E+01	NA	7.41E+00
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	6.08E+00	NA	2.81E-01	NA	2.16E+01	NA	3.08E+01	NA	1.17E+00	NA	1.18E+00	NA	1.22E+00	NA	3.37E-01
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	9.27E+01	1.35E+02	2.77E+00	4.03E+00	3.19E+02	4.64E+02	4.71E+02	6.85E+02	1.23E+01	1.78E+01	1.22E+01	1.77E+01	1.20E+01	1.75E+01	3.39E+00
2-Methylphenol	NA	NA	NA	NA	NA	NA	2.60E+03	NA	1.24E+02	NA	9.26E+03	NA	1.32E+04	NA	5.14E+02	NA	5.19E+02	NA	5.36E+02	NA	1.48E+02
2-Nitroaniline	NA	NA	NA	NA	NA	NA	1.17E+02	NA	5.66E+00	NA	4.18E+02	NA	5.95E+02	NA	2.34E+01	NA	2.37E+01	NA	2.45E+01	NA	6.76E+00
3,3-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-(2,4-Dichlorophenoxy) Butyric Acid	NA	NA	NA	NA	NA	NA	1.38E+01	NA	4.26E-01	NA	4.76E+01	NA	6.99E+01	NA	1.88E+00	NA	1.87E+00	NA	1.84E+00	NA	5.20E-01
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	1.25E+01	NA	5.60E-01	NA	4.43E+01	NA	6.32E+01	NA	2.35E+00	NA	2.36E+00	NA	2.43E+00	NA	6.73E-01
4-Chloroaniline	NA	NA	NA	NA	NA	NA	1.36E+01	NA	7.16E-01	NA	4.89E+01	NA	6.91E+01	NA	2.93E+00	NA	2.97E+00	NA	3.10E+00	NA	8.51E-01
4-Methyl-2-Pentanone	NA	NA	NA	NA	NA	NA	2.38E+02	NA	1.46E+01	NA	8.59E+02	NA	1.20E+03	NA	5.84E+01	NA	5.96E+01	NA	6.34E+01	NA	1.72E+01
4-Methylphenol (p-cresol)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroanoline	NA	NA	NA	NA	NA	NA	7.29E+02	NA	4.10E+01	NA	2.62E+03	NA	3.69E+03	NA	1.66E+02	NA	1.69E+02	NA	1.78E+02	NA	4.86E+01
4-Nitrophenol	NA	NA	NA	NA	NA	NA	2.86E+02	NA	1.42E+01	NA	1.02E+03	NA	1.45E+03	NA	5.86E+01	NA	5.93E+01	NA	6.15E+01	NA	1.69E+01
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	6.75E+01	1.51E+02	6.18E+00	1.38E+01	2.48E+02	5.54E+02	3.41E+02	7.63E+02	2.32E+01	5.18E+01	2.40E+01	5.36E+01	2.68E+01	5.99E+01	7.00E+00
Aldrin	NA	NA	NA	NA	NA	NA	3.62E+00	NA	4.70E-02	NA	1.13E+01	NA	1.85E+01	NA	2.33E-01	NA	2.25E-01	NA	2.04E-01	NA	5.89E-02
alpha-BHC	NA	NA	NA	NA	NA	NA	7.26E+02	NA	1.87E+01	NA	2.47E+03	NA	3.69E+03	NA	8.44E+01	NA	8.34E+01	NA	8.08E+01	NA	2.30E+01
Ammonium (as Ammonia)	NA	NA	NA	NA	NA	NA	7.32E+03	NA	5.86E+02	NA	2.67E+04	NA	3.70E+04	NA	2.25E+03	NA	2.31E+03	NA	2.54E+03	NA	6.73E+02
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1016[(1)]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221[(1)]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

221

Table B-7
Summary of ESLs for Terrestrial Vertebrate Receptors

ECOI	Mourning Dove - Herbivore		Mourning Dove - Insectivore		American Kestrel		Deer Mouse - Herbivore		Deer Mouse - Insectivore		Prarie Dog		Mule Deer		Coyote - Carnivore		Coyote - Generalist		Coyote - Insectivore		PMJM
	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)
Aroclor 1232[1]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242[1]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248[1]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254[1]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260[1]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	3.07E+02	NA	1.49E+01	NA	1.10E+03	NA	1.56E+03	NA	6.18E+01	NA	6.24E+01	NA	6.47E+01	NA	1.78E+01
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	3.37E+02	2.12E+03	6.31E-01	3.16E+00	5.03E+02	2.68E+03	2.41E+03	1.43E+04	3.06E+00	1.55E+01	2.97E+00	1.50E+01	2.76E+00	1.38E+01	8.00E-01
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(ghi)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl alcohol	NA	NA	NA	NA	NA	NA	7.00E+01	NA	4.40E+00	NA	2.53E+02	NA	3.54E+02	NA	1.75E+01	NA	1.79E+01	NA	1.91E+01	NA	5.17E+00
Beta-BHC	NA	NA	NA	NA	NA	NA	8.07E+00	NA	2.07E-01	NA	2.74E+01	NA	4.10E+01	NA	9.38E-01	NA	9.27E-01	NA	8.98E-01	NA	2.55E-01
BHC (Mixed)	4.69E+00	NA	8.18E-02	NA	2.12E-01	NA	3.23E+01	NA	8.29E-01	NA	1.10E+02	NA	1.64E+02	NA	3.75E+00	NA	3.71E+00	NA	3.59E+00	NA	1.02E+00
bis(2-chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-chloroisopropyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	1.95E+01	NA	1.37E-01	NA	3.98E-01	NA	9.60E+02	NA	8.07E+00	NA	2.76E+03	NA	4.93E+03	NA	4.23E+01	NA	4.02E+01	NA	3.50E+01	NA	1.02E+01
Bromodichloromethane	NA	NA	NA	NA	NA	NA	1.06E+02	NA	5.75E+00	NA	3.81E+02	NA	5.38E+02	NA	2.34E+01	NA	2.38E+01	NA	2.49E+01	NA	6.82E+00
Bromoform	NA	NA	NA	NA	NA	NA	5.55E+01	NA	2.85E+00	NA	1.99E+02	NA	2.81E+02	NA	1.17E+01	NA	1.19E+01	NA	1.24E+01	NA	3.40E+00
Bromomethane (methyl bromide)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	1.00E+03	NA	2.42E+01	NA	3.37E+03	NA	5.08E+03	NA	1.10E+02	NA	1.09E+02	NA	1.05E+02	NA	2.98E+01
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	1.15E+02	NA	5.68E+00	NA	4.11E+02	NA	5.83E+02	NA	2.34E+01	NA	2.37E+01	NA	2.46E+01	NA	6.77E+00
Carbon Tetrachloride	NA	0.00E+00	NA	0.00E+00	NA	0.00E+00	2.08E+02	NA	8.91E+00	NA	7.36E+02	NA	1.05E+03	NA	3.75E+01	NA	3.78E+01	NA	3.86E+01	NA	1.07E+01
Chlordane	2.65E+01	5.92E+01	2.89E-01	6.47E-01	7.93E-01	1.77E+00	1.49E+02	NA	2.21E+00	NA	4.73E+02	NA	7.59E+02	NA	1.07E+01	NA	1.04E+01	NA	9.55E+00	NA	2.75E+00
Chlorobenzene	NA	NA	NA	NA	NA	NA	1.17E+02	1.67E+02	4.75E+00	6.74E+00	4.14E+02	5.87E+02	5.95E+02	8.45E+02	2.02E+01	2.86E+01	2.03E+01	2.87E+01	2.06E+01	2.92E+01	5.73E+00
Chloroform	NA	NA	NA	NA	NA	NA	1.56E+02	NA	8.66E+00	NA	5.60E+02	NA	7.90E+02	NA	3.51E+01	NA	3.57E+01	NA	3.75E+01	NA	1.02E+01
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-dichloroethene	NA	NA	NA	NA	NA	NA	3.72E+01	NA	1.81E+00	NA	1.33E+02	NA	1.89E+02	NA	7.50E+00	NA	7.58E+00	NA	7.86E+00	NA	2.17E+00
DDD	NA	NA	NA	NA	NA	NA	2.54E+03	NA	1.37E+01	NA	6.19E+03	NA	1.32E+04	NA	6.63E+01	NA	6.44E+01	NA	5.95E+01	NA	1.74E+01
DDE	3.66E-01	NA	7.95E-03	NA	2.19E-02	NA	1.55E+01	NA	5.17E-01	NA	5.44E+01	NA	7.85E+01	NA	2.53E+00	NA	2.45E+00	NA	2.24E+00	NA	6.30E-01
DDT	2.26E-01	NA	1.20E-03	NA	3.34E-03	NA	7.21E+01	NA	3.79E-01	NA	1.76E+02	NA	3.75E+02	NA	1.87E+00	NA	1.81E+00	NA	1.64E+00	NA	4.80E-01
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	7.07E+02	NA	2.12E+01	NA	2.44E+03	NA	3.59E+03	NA	9.38E+01	NA	9.32E+01	NA	9.18E+01	NA	2.59E+01
Dibromochloromethane	NA	NA	NA	NA	NA	NA	1.09E+02	NA	5.73E+00	NA	3.89E+02	NA	5.50E+02	NA	2.34E+01	NA	2.37E+01	NA	2.48E+01	NA	6.81E+00
Dicamba	NA	NA	NA	NA	NA	NA	3.63E+01	NA	1.69E+00	NA	1.29E+02	NA	1.84E+02	NA	7.03E+00	NA	7.10E+00	NA	7.32E+00	NA	2.02E+00
Dichlorodifluoromethane	NA	NA	NA	NA	NA	NA	1.68E+01	NA	8.55E-01	NA	6.00E+01	NA	8.50E+01	NA	3.51E+00	NA	3.56E+00	NA	3.71E+00	NA	1.02E+00
Dieldrin	1.78E-01	NA	9.87E-03	NA	2.57E-02	NA	8.14E-02	NA	7.40E-03	NA	3.01E-01	NA	4.11E-01	NA	3.36E-02	NA	3.32E-02	NA	3.20E-02	NA	8.38E-03
Diethyl Ether	NA	NA	NA	NA	NA	NA	4.63E+02	NA	2.94E+01	NA	1.68E+03	NA	2.34E+03	NA	1.17E+02	NA	1.19E+02	NA	1.27E+02	NA	3.45E+01
Diethylphthalate	NA	NA	NA	NA	NA	NA	6.27E+04	NA	2.53E+03	NA	2.21E+05	NA	3.18E+05	NA	1.08E+04	NA	1.08E+04	NA	1.10E+04	NA	3.05E+03
Dimethoate	2.79E-01	NA	1.37E-02	NA	3.10E-02	NA	NA	NA	NA	NA	NA	0.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethylphthalate	NA	NA	NA	NA	NA	NA	3.77E+03	NA	2.01E+02	NA	1.35E+04	NA	1.91E+04	NA	8.20E+02	NA	8.31E+02	NA	8.70E+02	NA	2.38E+02
Di-n-butyl phthalate	9.89E-01	NA	1.59E-02	NA	4.15E-02	NA	1.21E+04	NA	2.81E+02	NA	4.06E+04	NA	6.13E+04	NA	1.29E+03	NA	1.27E+03	NA	1.22E+03	NA	3.47E+02
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	9.05E+04	NA	7.31E+02	NA	2.58E+05	NA	4.65E+05	NA	3.85E+03	NA	3.65E+03	NA	3.17E+03	NA	9.22E+02
Endosulfan	7.14E+01	NA	1.51E+00	NA	3.81E+00	NA	2.52E+00	NA	8.01E-02	NA	8.73E+00	NA	1.28E+01	NA	3.52E-01	NA	3.50E-01	NA	3.47E-01	NA	9.78E-02
Endrin	1.06E-01	NA	1.40E-03	NA	3.74E-03	NA	2.46E+00	NA	4.55E-02	NA	8.06E+00	NA	1.25E+01	NA	2.15E-01	NA	2.10E-01	NA	1.97E-01	NA	5.66E-02
Ethyl acetate	NA	NA	NA	NA	NA	NA	8.69E+02	NA	5.25E+01	NA	3.14E+03	NA	4.40E+03	NA	2.10E+02	NA	2.14E+02	NA	2.28E+02	NA	6.18E+01
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoride	2.68E+01	NA	1.33E+00	NA	3.03E+00	NA	2.37E+02	NA	1.90E+01	NA	8.67E+02	NA	1.20E+03	NA	7.30E+01	NA	7.51E+01	NA	8.25E+01	NA	2.19E+01
Heptachlor	NA	NA	NA	NA	NA	NA	3.83E+00	2.77E+01	6.33E-02	4.58E-01	1.24E+01	8.94E+01	1.95E+01	1.41E+02	3.04E-01	2.20E+00	2.95E-01	2.14E+00	2.74E-01	1.98E+00	7.89E-02
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	2.71E+00	NA	6.40E-02	NA	9.12E+00	NA	1.38E+01	NA	2.93E-01	NA	2.89E-01	NA	2.77E-01	NA	7.90E-02
Hexachlorobenzene	6.46E-01	NA	7.73E-03	NA	2.10E-02	NA	5.89E+01	NA	9.74E-01	NA	1.90E+02	NA	3.00E+02	NA	4.67E+00	NA	4.54E+00	NA	4.22E+00	NA	1.21E+00
Hexachlorobutadiene	2.76E+01	NA	4.31E-01	NA	1.13E+00	NA	4.50E+01	NA	1.02E+00	NA	1.51E+02	NA	2.29E+02	NA	4.68E+00	NA	4.61E+00	NA	4.41E+00	NA	1.26E+00
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	2.38E+02	NA	5.52E+00	NA	8.00E+02	NA	1.21E+03	NA	2.53E+01	NA	2.49E+01	NA	2.39E+01	NA	6.81E+00
Hexachloroethane	NA	NA	NA	NA	NA	NA	1.34E+01	1.89E+01	3.66E-01	5.18E-01	4.57E+01	6.46E+01	6.79E+01	9.60E+01	1.64E+00	2.32E+00	1.63E+00	2.30E+00	1.59E+00	2.24E+00	4.50E-01
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lindane	1.67E+01	NA	2.92E-01	NA	7.57E-01	NA	1.01E+00	NA	2.59E-02	NA	3.42E+00	NA	5.13E+00	NA	1.17E-01	NA	1.16E-01	NA	1.12E-01	NA	3.19E-02
Methoxychlor	NA	NA	NA	NA	NA	NA	7.05E+01	NA	1.23E+00	NA	2.29E+02	NA	3.59E+02	NA	5.84E+00	NA	5.69E+00	NA	5.31E+00	NA	1.53E+00
Methyl Ethyl Ketone	NA	NA	NA	NA	NA	NA	1.35E+04	NA	1.07E+03	NA	4.94E+04	NA	6.84E+04	NA	4.12E+03	NA	4.24E+03	NA	4.64E+03	NA	1.23E+03
Methyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	NA	NA	NA	NA	NA	NA	5.82E+01	1.70E+02	3.40E+00	9.94E+00	2.10E+02	6.13E+02	2.95E+02	8.61E+02	1.37E+01	4.00E+01	1.39E+01	4.07E+01	1.47E+01	4.31E+01	4.01E+00
Methyl-tertbutyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA
Napthalene	NA	NA	NA	NA	NA	NA	8.08E+03	NA	2.71E+01	NA	1.60E+04	NA	5.57E+04	NA	1.04E+02	NA	1.07E+02	NA	1.18E+02	NA	1.23E+04
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	5.99E+02	1.20E+03	3.35E+01	6.70E+01	2.15E+03	4.30E+03	3.03E+03	6.06E+03	1.36E+02	2.72E+02	1.38E+02	2.76E+02	1.45E+02	2.90E+02	3.97E+01
n-Nitrosodipropylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	NA	NA	NA	NA	NA	NA	2.36E+02	NA	1.60E+01	NA	8.58E+02	NA	1.20E+03	NA	6.30E+01	NA	6.44E+01	NA	6.94E+01	NA	1.87E+01
PCB	1.14E+00	NA	1.72E-01	NA	8.66E-01	NA	1.19E+01	1.70E+01	1.24E+00	1.61E+00	3.80E+01	5.32E+01	6.13E+01	8.60E+01	5.19E+00	6.04E+00	3.32E+00	3.88E+00	3.68E+00	4.62E+00	1.35E+00
Pendimethalin	NA	NA	NA	NA	NA	NA	5.77E+01	NA	1.27E+00	NA	1.93E+02	NA	2.93E+02	NA	5.85E+00	NA	5.75E+00	NA	5.49E+00	NA	1.57E+00
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	2.06E+01	NA	4.28E-01	NA	6.84E+01	NA	1.05E+02	NA	1.99E+00	NA	1.95E+00	NA	1.85E+00	NA	5.30E-01
Pentachloronitrobenzene	6.91E+01	NA	1.00E+00	NA	2.66E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	5.50E+00	1.74E+01	1.22E-01	3.86E-01	1.84E+01	5.82E+01	2.79E+01	8.85E+01	5.62E-01	1.78E+00	5.53E-01	1.75E+00	5.28E-01	1.67E+00	1.51E-01
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	4.15E+02	NA	2.31E+01	NA	1.49E+03	NA	2.10E+03	NA	9.36E+01	NA	9.51E+01	NA	1.00E+02	NA	2.73E+01
p-Nitrotoluene	NA	NA	NA	NA	NA	NA	1.40E+03	NA	6.14E+01	NA	4.97E+03	NA	7.11E+03	NA	2.58E+02	NA	2.60E+02	NA	2.66E+02	NA	7.38E+01
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	4.35E+02	NA	1.64E+01	NA	1.53E+03	NA	2.21E+03	NA	7.04E+01	NA	7.05E+01	NA	7.11E+01	NA	1.99E+01

228

Table B-7

Summary of ESLs for Terrestrial Vertebrate Receptors

ECOI	Mourning Dove - Herbivore		Mourning Dove - Insectivore		American Kestrel		Deer Mouse - Herbivore		Deer Mouse - Insectivore		Prarie Dog		Mule Deer		Coyote - Carnivore		Coyote - Generalist		Coyote - Insectivore		PMJM
	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)	Threshold (mg/kg)	NOAEL (mg/kg)
Sulfotep	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TCDD (Dioxin)	1.94E-04	NA	1.34E-05	NA	7.75E-05	NA	3.75E-05	NA	4.25E-06	NA	1.16E-04	NA	1.92E-04	NA	7.35E-05	NA	3.39E-05	NA	1.46E-05	NA	4.61E-06
Toluene	NA	NA	NA	NA	NA	NA	3.47E+02	NA	1.44E+01	NA	1.22E+03	NA	1.76E+03	NA	6.10E+01	NA	6.13E+01	NA	6.25E+01	NA	1.74E+01
Toxaphene	NA	NA	NA	NA	NA	NA	2.93E+02	NA	3.76E+00	NA	9.09E+02	NA	1.49E+03	NA	1.86E+01	NA	1.80E+01	NA	1.63E+01	NA	4.70E+00
trans-1,2-dichloroethene	NA	NA	NA	NA	NA	NA	5.26E+02	NA	2.56E+01	NA	1.87E+03	NA	2.66E+03	NA	1.06E+02	NA	1.07E+02	NA	1.11E+02	NA	3.06E+01
Trichloroethene	NA	NA	NA	NA	NA	NA	9.17E+00	NA	3.89E-01	NA	3.24E+01	NA	4.65E+01	NA	1.64E+00	NA	1.65E+00	NA	1.69E+00	NA	4.69E-01
Trichlorofluoromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trifluralin	NA	NA	NA	NA	NA	NA	8.42E+01	NA	1.62E+00	NA	2.77E+02	NA	4.28E+02	NA	7.60E+00	NA	7.44E+00	NA	7.01E+00	NA	2.01E+00
Vinyl acetate	NA	NA	NA	NA	NA	NA	2.01E+02	NA	1.40E+01	NA	7.31E+02	NA	1.02E+03	NA	5.48E+01	NA	5.61E+01	NA	6.06E+01	NA	1.63E+01
Vinyl Chloride	NA	NA	NA	NA	NA	NA	1.81E+00	NA	9.77E-02	NA	6.49E+00	NA	9.17E+00	NA	3.98E-01	NA	4.04E-01	NA	4.23E-01	NA	1.16E-01
Xylene (Mixed)	NA	NA	NA	NA	NA	NA	3.20E+01	NA	1.14E+00	NA	1.12E+02	NA	1.62E+02	NA	4.93E+00	NA	4.93E+00	NA	4.94E+00	NA	1.38E+00

(1) ESLs are provided for Total PCBs

Notes:

All values are presented in mg/kg soil (dry weight)

Threshold ESLs are calculated using threshold TRVs derived for site-specific use.

NA = Not available.

Table B-8
ESLs for Radionuclides

ECOIs	Soil; Terrestrial Species (pCi/g)	Sediment; Riparian Species (pCi/g)	Surface Water; Aquatic Animal (pCi/L)
Americium-241	3.89E+03	5.15E+03	4.38E+01
Cesium-137	2.08E+01	3.12E+03	4.26E+01 [1]
Hydrogen-3	1.74E+05	3.74E+05	2.65E+08 [1]
Plutonium-238	NA [2]	NA	NA
Plutonium-239	6.11E+03	5.86E+03	1.87E+01
Radium-226	5.06E+01	1.01E+02	1.02E+00
Radium-228	4.39E+01	8.78E+01	8.49E-01
Strontium-89	NA	NA	NA
Strontium-90	2.25E+01	5.82E+02	2.78E+02 [1]
Uranium-233/234	4.98E+03	5.28E+03	2.01E+01
Uranium-235	2.77E+03	3.73E+03	2.17E+01
Uranium-238	1.58E+03	2.49E+03	2.23E+01

Source: RESRAD-BIOTA BCG Level 1

1 - Riparian species is the limiting receptor.

2 - NA = not available

Appendix C

APPENDIX C
Regulatory Contact Records

231

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
ER REGULATORY CONTACT RECORD

Date/Time:	April 14, 2005			
Site Contact(s):	Julie Keating			
Phone:	303 966-5205 K-H RISS			
Regulatory Contact:	Carl Spreng	Tracy Hammon	Robyn Blackburn	Susan Griffin
Phone:	303 692-3358	303-692-2693	303-312-6663	303-312-6651
Agency:	CDPHE	CDPHE	USEPA	USEPA

Purpose of Contact: Documentation of Background Data Set and Statistical Comparisons of Site Data to Background Data

Discussion

During a meeting of the Risk Assessment Working Group on March 24, 2005, alternate approaches to defining background data sets and performing statistical comparisons of Exposure Unit (EU/Aquatic Exposure Unit (AEU) data to the background data were discussed. These approaches refined those defined in the Comprehensive Risk Assessment (CRA) Work Plan and Methodology (DOE 2004). In a meeting between Julie Keating (K-H RISS), Robyn Blackburn (USEPA), Tracy Hammon (CDPHE), and Susan Griffin (USEPA) on April 4, 2005, a final approach was defined and is described herein.

Background data for the site were collected under two programs, and are summarized in two separate reports. Surface soil background data are summarized in the Geochemical Characterization of Background Surface Soils: Background Soils Characterization Program (BSCP) (DOE 1995). Background data for all other environmental media are summarized in the Background Geochemical Characterization Report (BGCR) (DOE 1993).

For surface soil, the CRA will use only BSCP data for background comparisons. These surface soil sample locations are not on site.

For subsurface soil, stream sediment, and stream surface water, the CRA will use most of the BGCR sample locations. Per our discussion on April 4, data for three downstream sampling locations will be removed from the BGCR background data set; SW004/SED022 and SW108/SED021 in the Rock Creek drainage, and SW041/SED041/SED017 in the Woman Creek drainage (see attached map). For all remaining BGCR background sampling locations, all BGCR data will be used as well as all data collected through 2004 at these locations (applicable to surface water and sediment sampling). The BGCR sampling locations are all on site. Please note that only sediment and surface water data for streams, and not seeps, are used for background data. SED018, SED019, and SW131 in the Antelope Springs area of the Woman Creek drainage were removed because these sampling locations are associated with seeps.

Background data sets will be recalculated for surface soil, subsurface soil, sediment (all depths), surface soil combined with surface sediment (end depth 6 inches or less), subsurface soil combined with subsurface sediment (end depth greater than 6 inches), surface water (total concentrations), and surface water (dissolved concentrations). The combined surface soil/surface sediment and the subsurface soil/subsurface sediment background data sets will be developed because the data for these media are combined on an EU basis to select Contaminants of Concern (COCs) in evaluating risk to human receptors. The determination of the COCs requires a comparison of EU data to the appropriate background data set.

In determining COCs and Ecological Contaminants of Potential Concern (ECOPCs), EU and AEU data will be statistically compared to the appropriate background data set to determine if the analytes are at concentrations within background levels in the EU/AEU. Before performing the statistical comparison, background data for locations within an EU/AEU will be removed from the EU/AEU data set, as appropriate. For COCs, the background data will be reaggregated with the EU/AEU data for calculation of the Exposure Point Concentrations (EPCs).

References:

DOE, 1993, Background Geochemical Characterization Report, Rocky Flats Environmental Technology Site, Golden, Colorado, September.

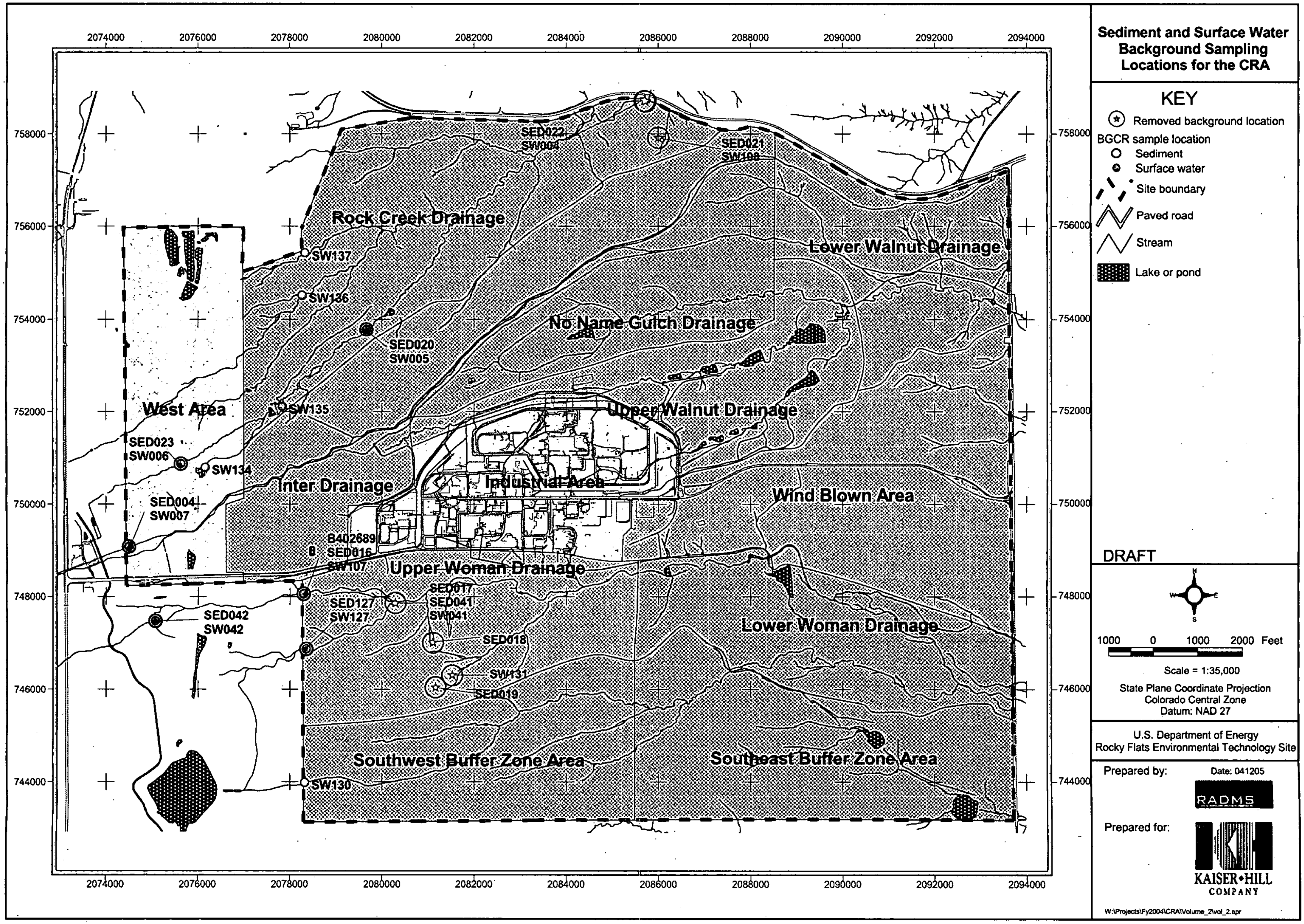
DOE, 1995, Geochemical Characterization of Background Surface Soils: Background Soils Characterization Program, Rocky Flats Environmental Technology Site, Golden, Colorado, May.

DOE, 2004, Final Comprehensive Risk Assessment Work Plan and Methodology, Rocky Flats Environmental Technology Site, Golden, Colorado, September.

Contact Record Prepared By: Julie Keating

Required Distribution:		Additional Distribution:
M. Aguilar, USEPA	J. Legare, DOE-RFPO	
H. Ainscough, CDPHE	D. Mayo, K-H RISS	
J. Berardini, K-H	S. Nesta, K-H RISS	
B. Birk, DOE-RFPO	L. Norland, K-H RISS	
L. Brooks, K-H ESS	E. Pottorff, CDPHE	
G. Carnival, K-H RISS	A. Primrose, K-H RISS	
N. Castaneda, DOE-RFPO	M. Roy, DOE-RFPO	
C. Deck, K-H Legal	R. Schassburger, DOE-RFPO	
N. Demos, SSOC	S. Serreze, K-H RISS	
S. Garcia, USEPA	D. Shelton, K-H ESS	
S. Gunderson, CDPHE	C. Spreng, CDPHE	
S. Johnson, K-H ESS	S. Surovchak, DOE-RFPO	
M. Keating, K-H RISS	J. Walstrom, K-H RISS	
L. Kimmel, USEPA	K. Wiemelt, K-H RISS	
D. Kruchek, CDPHE	C. Zahm, K-H Legal	

234


Sediment and Surface Water Background Sampling Locations for the CRA
KEY
Removed background location
BGCR sample location
Sediment
Surface water
Site boundary
Paved road
Stream
Lake or pond
DRAFT
N
S
W
E
1000 0 1000 2000 Feet
Scale = 1:35,000
State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27
U.S. Department of Energy
Rocky Flats Environmental Technology Site
Prepared by:
Date: 041205
RADMS
Prepared for:
KAISER•HILL
COMPANY
W:\Projects\Fy2004\CRA\Volume_2\vol_2.apr
Rock Creek Drainage
Lower Walnut Drainage
No Name Gulch Drainage
West Area
Upper Walnut Drainage
Inter Drainage
Industrial Area
Wind Blown Area
Upper Woman Drainage
Lower Woman Drainage
Southwest Buffer Zone Area
Southeast Buffer Zone Area
SED022
SW004
SED021
SW109
SW137
SW136
SED020
SW005
SW135
SED023
SW006
SW134
SED004
SW007
B402689
SED016
SW107
SED127
SW127
SED017
SED041
SW041
SED042
SW042
SED018
SW131
SED019
SW130
2074000
2076000
2078000
2080000
2082000
2084000
2086000
2088000
2090000
2092000
2094000
758000
756000
754000
752000
750000
748000
746000
744000

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
ER REGULATORY CONTACT RECORD

Date/Time:	April 18, 2005		
Site Contact(s):	Julie Keating		
Phone:	303/966-5205		
Regulatory Contact:	Carl Spreng	Tracy Hammon	Robyn Blackburn
Agency:	CDPHE	CDPHE	USFWS Liaison to USEPA
Phone:	303/692-3385	303/692-2693	303/312-6663

Purpose of Contact: Documentation of Aquatic Exposure Units for the Comprehensive Risk Assessment and Accelerated Action Ecological Screening Evaluation

Discussion

During the latter stages of development of the Comprehensive Risk Assessment (CRA) Work Plan and Methodology (CRA Methodology) (DOE 2004a) in August 2004, it was suggested in a Risk Assessment Work Group Meeting (August 5, 2004) that the aquatic assessment (surface water and sediment) for ecological receptors be performed on a watershed-specific basis rather than the exposure unit (EU) basis already agreed upon for terrestrial ecological receptors. DOE agreed to the suggested modification, text was added to the final CRA Methodology specifying a watershed-specific assessment, and draft drainage EUs were prepared for the work group's review.

Following discussion of the proposed drainage EUs in subsequent work group meetings, the group concurred on the final configuration (October 14) of seven EUs. However, concurrence occurred after publication of the Final CRA Methodology in September 2004. This Contact Record documents the drainage EUs.

The attached map shows the drainage EUs identified as follows:

- Rock Creek Aquatic EU;
- McKay Ditch Aquatic EU;
- No Name Gulch Aquatic EU;
- North Walnut Creek Aquatic EU
- South Walnut Creek Aquatic EU;
- Woman Creek Aquatic EU; and
- Southeast Aquatic EU.

The names of the EUs have been changed slightly by DOE from the names on the EU boundary map agreed upon by the work group. This was done to clearly identify them as aquatic and avoid confusion with the terrestrial EUs. The aquatic EU boundaries are those agreed upon by the work group. Volume 15 of the CRA Report will be re-titled to read: "Risk Assessment for Aquatic Receptors and Wide-Ranging Ecological Receptors."

235

The aquatic EUs will also be evaluated to determine whether there is a need to perform accelerated actions to protect aquatic ecological receptors. The Accelerated Action Ecological Screening Evaluation (AAESE) for the Aquatic EUs follows the ecological contaminant of potential concern (ECOPC) procedure specified in appendix D of the Industrial Area and Buffer Zone Sampling and Analysis Plan (DOE 2004b) and the CRA Methodology. Assessments will be performed to evaluate data from areas within the EU that may be of concern because of the distribution of ecological contaminant of interest (ECOI) sampling and concentrations. Two sets of maps will be produced to be included in the assessment. ECOIs will be mapped when:

1. The ECOI maximum concentration is greater than the ESL, but the 95 percent upper confidence limit on the mean (UCL) or 95 percent upper tolerance limit (UTL) is less than the ecological screening level (ESL).

2. The ECOI is detected at a frequency of less than 5 percent.

These maps will ensure that ECOIs that may be of concern in ponds and other limited reaches of the watershed are properly assessed.

References:

DOE, 2004a, Final Comprehensive Risk Assessment Work Plan and Methodology, Rocky Flats Environmental Technology Site, Golden, Colorado, September.

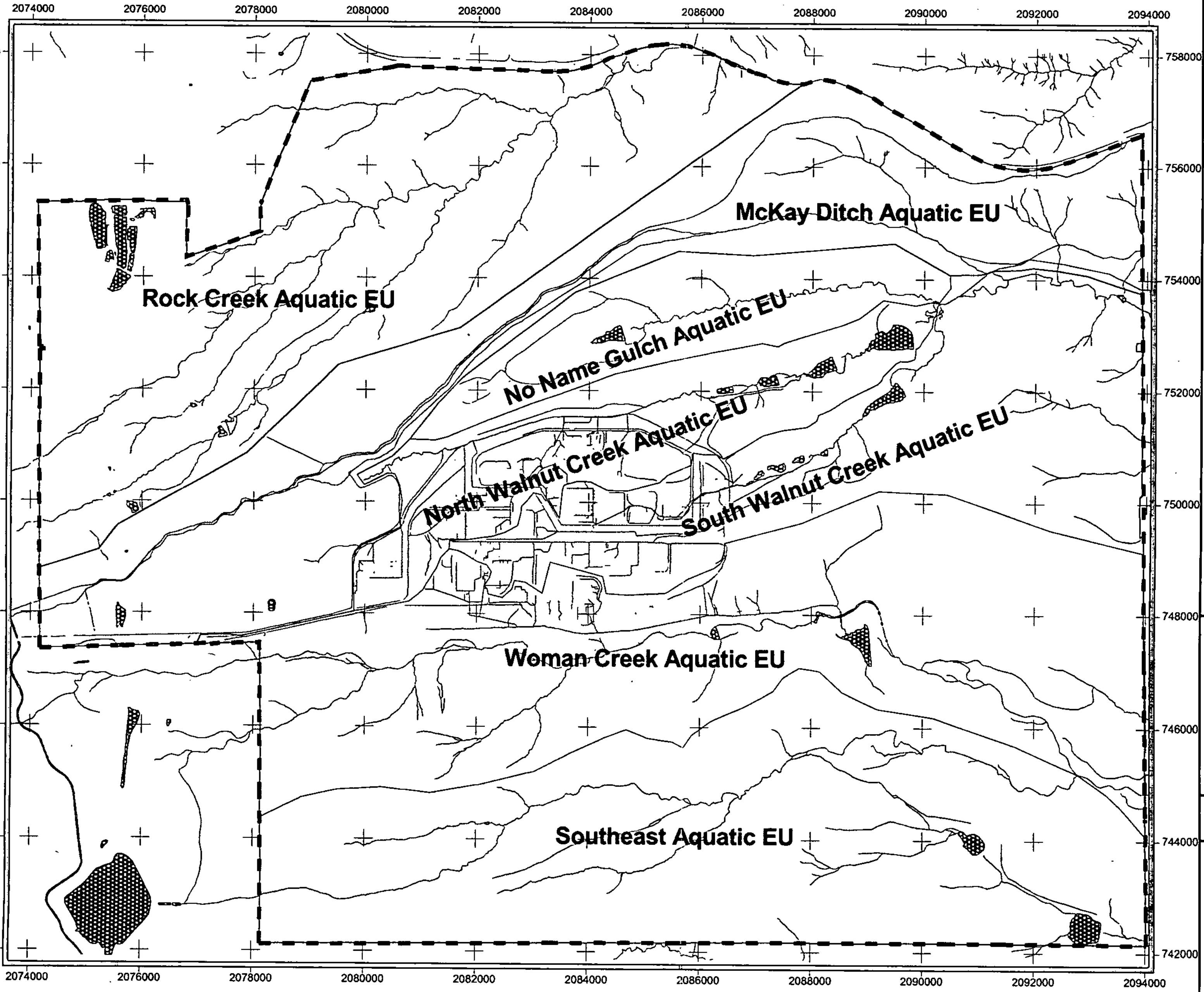
DOE, 2004b, Industrial Area and Buffer Zone Sampling and Analysis Plan, Rocky Flats Environmental Technology Site, Golden, Colorado, May

---

Contact Record Prepared By: Julie Keating

Required Distribution:		Additional Distribution:
M. Aguilar, USEPA	J. Legare, DOE-RFPO	T. Hammon, CDPHE
H. Ainscough, CDPHE	D. Mayo, K-H RISS	R. Blackburn, USFWS
J. Berardini, K-H	S. Nesta, K-H RISS	Liaison to USEPA
B. Birk, DOE-RFPO	L. Norland, K-H RISS	
L. Brooks, K-H ESS	E. Pottorff, CDPHE	
G. Carnival, K-H RISS	A. Primrose, K-H RISS	
N. Castaneda, DOE-RFPO	M. Roy, DOE-RFPO	
C. Deck, K-H Legal	R. Schassburger, DOE-RFPO	
N. Demos, SSOC	S. Serreze, K-H RISS	
S. Garcia, USEPA	D. Shelton, K-H ESS	
S. Gunderson, CDPHE	C. Spreng, CDPHE	
S. Johnson, K-H ESS	S. Surovchak, DOE-RFPO	
M. Keating, K-H RISS	J. Walstrom, K-H RISS	
L. Kimmel, USEPA	K. Wiemelt, K-H RISS	
D. Kruchek, CDPHE	C. Zahm, K-H Legal	

237



Rocky Flats Environmental Technology Site Aquatic Exposure Units

KEY

- Site boundary
- Stream
- Pond
- Paved road

N E S W

1000 0 1000 Feet

Scale = 1:32,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Date: 02.02.05

Prepared by: RADMS

Prepared for: KAISER•HILL COMPANY

File: W:\Projects\Fy2004\CRA\exposure_units.apr

DRAFT
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
ER REGULATORY CONTACT RECORD

Date/Time:	July 21, 2005		
Site Contact(s):	Julie Keating		
Phone:	303/966-5205		
Regulatory Contact:	Carl Spreng	Raj Goyal	Robyn Blackburn
Agency:	CDPHE	CDPHE	USFWS Liaison to USEPA
Phone:	303/692-3385	303/692-2693	303/312-6663

Purpose of Contact: Documentation of refinements to the CRA COC/ECOPC flowcharts

---

Discussion

During the completion of the Comprehensive Risk Assesment (CRA), several refinements to the contaminants of concern (COC) selection process for the human health risk assessments and the ecological contaminants of potential concern (ECOPCs) for the ecological risk assessments have been identified that will improve the transparency and efficiency of the selection of COCs and ECOPCs for the CRA. These refinements to the CRA Methodology were preliminarily discussed by the Risk Assessment Working Group (RAWG) during the May 11, 2005 RAWG meeting. Additional discussions of the refined flowcharts took place on June 23, 2005 and July 12, 2005. The changes that were agreed upon by the regulatory agencies and DOE as a result of these meetings are documented on the attached figures that will act as replacements for the existing Figures 4.4 and 7.3 in the CRA Methodology.

The change in Figure 4.4 for the COC selection process is an additional step for the preliminary remediation goal (PRG) screen. In the CRA Methodology, the PRG screen consisted of a comparison of maximum detected concentrations of each preliminary COC (PCOC) to the PRGs (shown as Step 1a on the attached Revised Figure 4.4). The additional step consists of a comparison of the upper confidence limit on the mean (UCL) to the PRG (shown as Step 1b on the attached Revised Figure 4.4). This additional step was recommended by EPA and CDPHE based on EPA Region 8 guidance for selection of COCs (EPA 1994).

The primary changes in Figure 7.3 are as follows:

- Addition of a professional judgment evaluation for the Preble's meadow jumping mouse (PMJM) ECOPCs (shown as Step 5 in the PMJM section on the attached Revised Figure 7.3).
- Change in the order of the steps for the non-PMJM receptors ECOPCs; the professional judgment evaluation was moved so that it occurs after the comparison of exposure point concentrations (EPCs) to ecological screening levels (professional judgment is shown as Step 5 in the non-PMJM section on the attached Revised Figure 7.3).

238

- Change in the wording of the Background Comparison step for the PMJM ECOPCs. The wording was changed from "Is sampling location concentration > background?" to "Is PMJM habitat > background?" (shown as Step 3 in the PMJM section of the attached Revised Figure 7.3).

Separate background comparisons will be conducted for PMJM and non-PMJM receptors as outlined in the CRA Methodology. For the PMJM receptors, the data set from the PMJM habitat areas within an EU will be compared to the background surface soil data set using a statistical test (i.e., Student's t-test or Wilcoxon Rank Sum Test depending on the distributions of the data sets). The rationale for aggregating data across the PMJM habitat areas within an EU will be provided in the CRA. The rationale will include statements related to lack of spatial patterns, fate and transport processes, and site processes that would have resulted in impacts to specific sub-areas with the PMJM habitat areas within an EU. For the non-PMJM receptors, the data set for the whole EU will be compared to the background surface soil data set using a statistical test as described above for the PMJM receptors.

If it is determined that concentrations of an ecological contaminant of interest (ECOI) are not statistically greater than site-specific background concentrations, it is not retained for further risk assessment and will be documented in the uncertainty section of the CRA. If it cannot be determined that on-site concentrations of the ECOI are similar to background concentrations using the statistical test, the ECOI is discussed in a professional judgment evaluation as outlined in the CRA Methodology.

The professional judgment evaluations will include summaries of EU-wide physical characteristics, data quality assessment and spatial pattern recognition. In addition, chemical-specific discussions of process knowledge, spatial trend evaluations, pattern recognition, and qualitative risk potential will be provided in the professional judgment sections of each CRA volume. The professional judgment sections will discuss the above lines-of-evidence in terms of non-PMJM and PMJM receptors where appropriate.

Additional refinements to Figure 7.3 were made so that the Data Quality Assessment (DQA) screen applies to both PMJM and non-PMJM receptors and the detection frequency and background comparison steps are shown as decision boxes (diamonds) and are separated into two distinct steps.

Reference: U.S. Environmental Protection Agency (EPA) 1994. "Evaluating and Identifying Contaminants of Concern for Human Health." Region 8 Superfund Technical Guidance. No. RA-03. September.

Attachments: Revised Figure 4.4 Human Health CRA COC Selection Process and Figure 7.3 Sitewide ECOPC Identification Process (CRA Methodology).

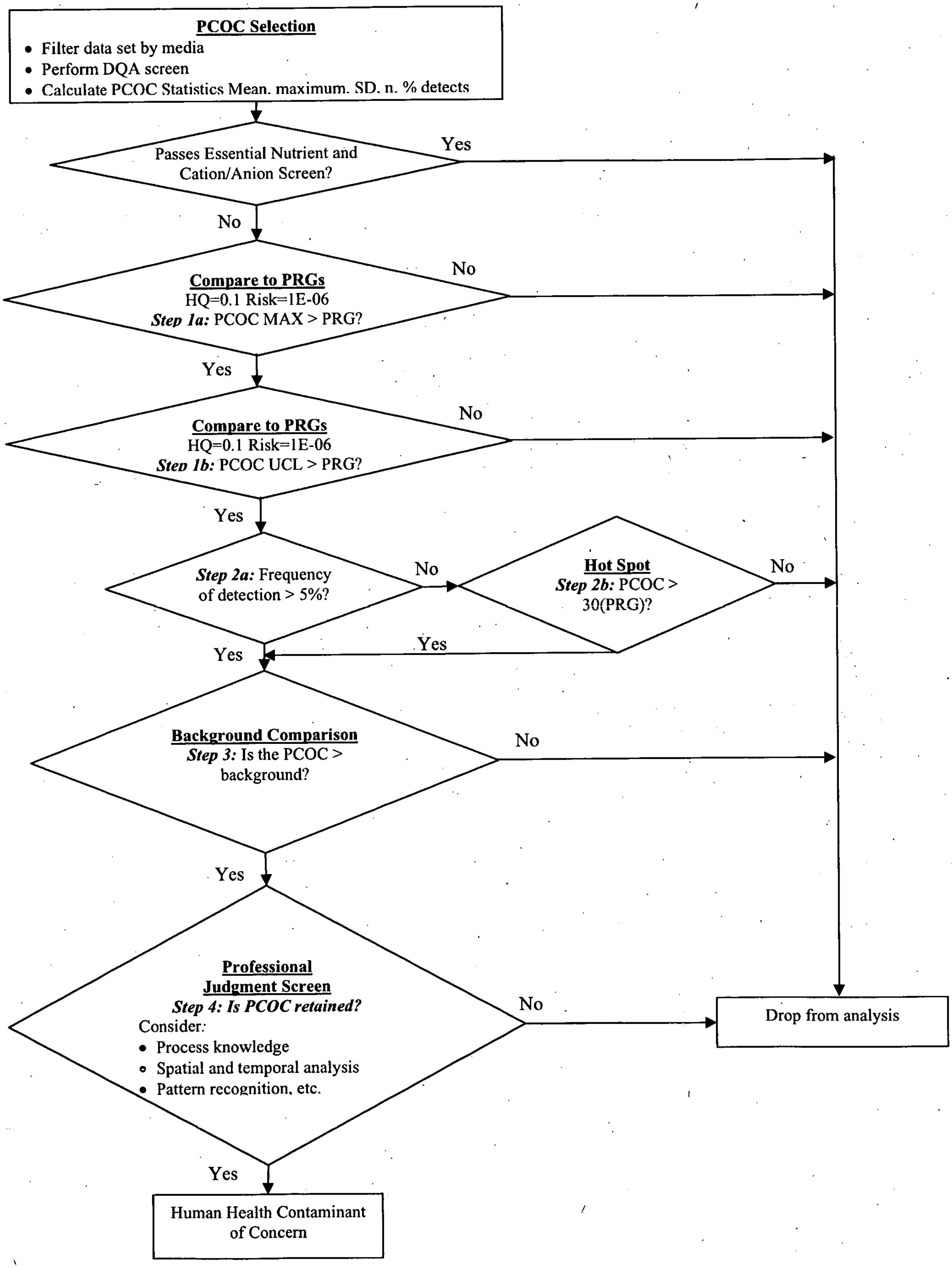
Contact Record Prepared By: Julie Keating

Required Distribution:		Additional Distribution:
M. Aguilar, USEPA	J. Legare, DOE-RFPO	T. Hammon, CDPHE
H. Ainscough, CDPHE	D. Mayo, K-H RISS	R. Blackburn, USFWS
J. Berardini, K-H	S. Nesta, K-H RISS	Liaison to USEPA
B. Birk, DOE-RFPO	L. Norland, K-H RISS	
L. Brooks, K-H ESS	E. Pottorff, CDPHE	
G. Carnival, K-H RISS	A. Primrose, K-H RISS	
N. Castaneda, DOE-RFPO	M. Roy, DOE-RFPO	
C. Deck, K-H Legal	R. Schassburger, DOE-RFPO	
N. Demos, SSOC	S. Serreze, K-H RISS	
S. Garcia, USEPA	D. Shelton, K-H ESS	
S. Gunderson, CDPHE	C. Spreng, CDPHE	
S. Johnson, K-H ESS	S. Surovchak, DOE-RFPO	

239

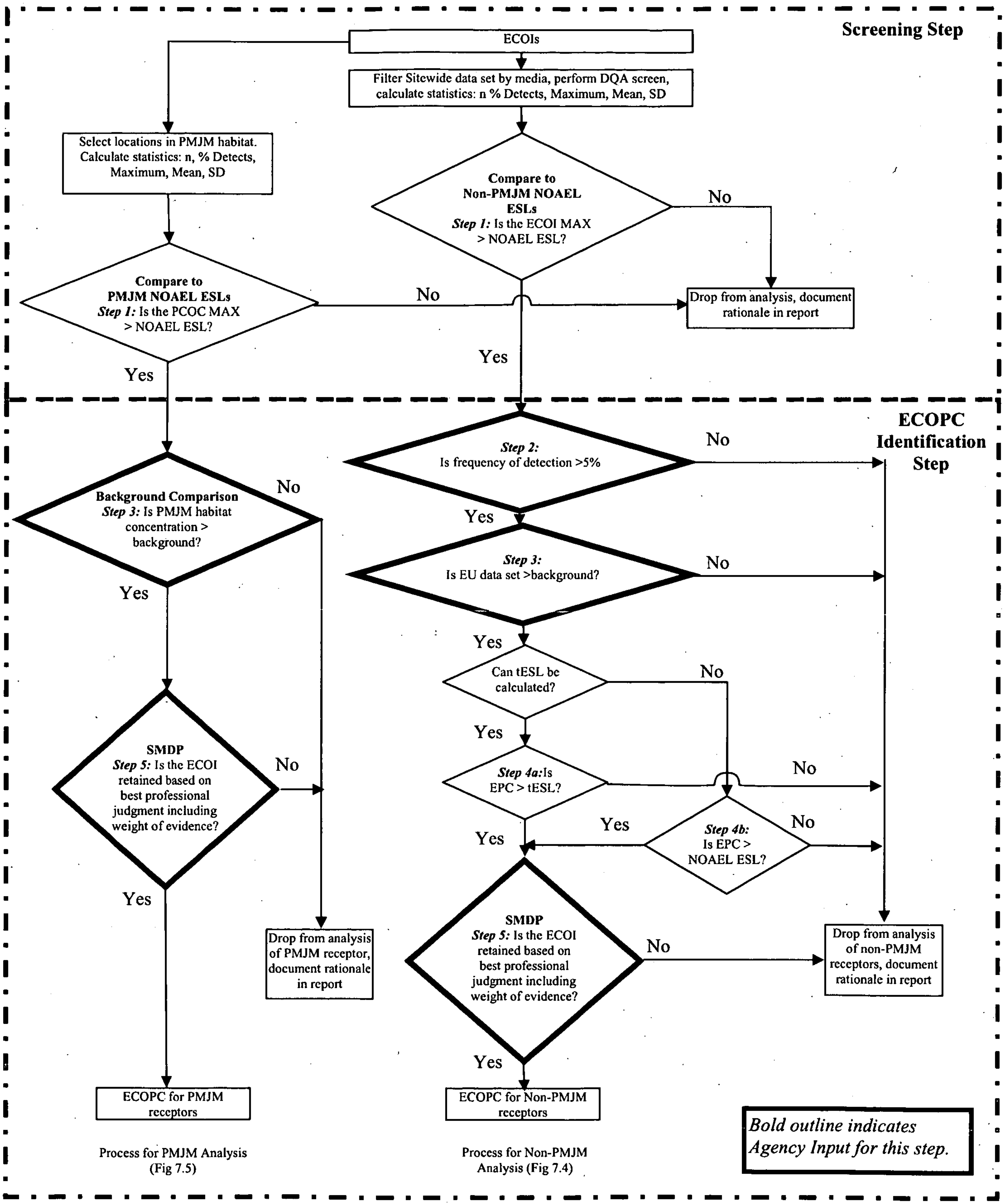
M. Keating, K-H RISS	J. Walstrom, K-H RISS	____________
L. Kimmel, USEPA	K. Wiemelt, K-H RISS	____________
D. Kruchek, CDPHE	C. Zahm, K-H Legal	____________

Figure 4.4 Human Health CRA COC Selection Process



241

Figure 7.3 Sitewide ECOPC Identification Process



242

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
ER REGULATORY CONTACT RECORD

Date/Time:	September 22, 2005		
Site Contact(s):	Julie Keating		
Phone:	303-966-5205		
Regulatory Contact:	Carl Spreng	Raj Goyal	Robyn Blackburn
Phone:	303/692-3385	303/692-2634	303/312-6663
Agency:	CDPHE	CDPHE	USFWS Liaison to USEPA

Purpose of Contact: Documentation of CRA Ecological Risk Characterization Format

Discussion

During the preparation of the pre-draft Comprehensive Risk Assessment (CRA) volumes, several meetings and conference calls were held to discuss the format for presenting ecological risk characterization results for the Exposure Units (EUs) at RFETS. The purpose of this contact record is to document the format for presenting the hazard quotient (HQ) assessments that was agreed upon by the CRA Team and the regulatory agencies during a conference call on September 14, 2005.

HQs will be presented for each ecological contaminant of potential concern (ECOPC)/receptor pair that is carried forward to risk characterization. HQs will first be calculated based on default exposure parameters, default bioaccumulation factors (BAFs), default no observed adverse effects levels (NOAELs), threshold effects levels (if available), and default lowest observed adverse effects levels (LOAELs) (if available) that are identified in the CRA Methodology (DOE 2004).

For large home range receptors, the upper confidence limits on the means (UCLs) as determined using ProUCL software (Singh, et al. 2004) will be used as the exposure point concentrations (EPCs) for the HQ calculations. For small home range receptors, the 95 percent upper confidence limits on the 90th percentiles (UTLs) as determined using S+ software (Insightful 2002) will be used as the EPCs for the HQ calculations. For the Preble's meadow jumping mouse (PMJM), the UCLs calculated for the habitat patches will be used as the EPCs for the HQ calculations. In cases where the calculated UCL or UTL exceeds the maximum detected concentration (MDC), the MDC will be used as the EPC. Both Tier 1 and Tier 2 EPCs, as defined in the CRA Methodology, will be used for the default HQ calculations.

For ECOPC/receptor pairs with HQs less than or equal to one based on default parameters and LOAEL values, a qualitative uncertainty discussion will be provided and no additional HQ calculations will be performed. For ECOPC/receptor pairs with HQs greater than one based on default parameter and LOAEL values, an additional HQ assessment will be conducted using

243

alternate exposure scenarios, BAFs, and toxicity reference values, as appropriate, to provide a quantitative evaluation of the uncertainties associated with the default parameters.

References:
DOE 2004. Final Comprehensive Risk Assessment Work Plan and Methodology, Rocky Flats Environmental Technology Site. Golden, Colorado. September.

Insightful Corporation, 2002. S-Plus 6 for Windows. Seattle, Washington.

Singh, A, A.K. Singh, and R.W. Maichle, 2004. ProUCL Version 3.0. Users Guide. Las Vegas, Nevada. April.

Contact Record Prepared By: Julie Keating

Required Distribution:		Additional Distribution:
M. Aguilar, USEPA	D. Mayo, K-H RISS	R.Goyal, CDPHE
H. Ainscough, CDPHE	S. Nesta, K-H RISS	R. Blackburn, EPA
J. Berardini, K-H	L. Norland, K-H RISS	
B. Birk, DOE-RFPO	E. Pottorff, CDPHE	
L. Brooks, K-H ESS	A. Primrose, K-H RISS	
G. Carnival, K-H RISS	M. Roy, DOE-RFPO	
N. Castaneda, DOE-RFPO	R. Schassburger, DOE-RFPO	
C. Deck, K-H Legal	S. Serreze, K-H RISS	
N. Demos, SSOC	D. Shelton, K-H ESS	
S. Garcia, USEPA	C. Spreng, CDPHE	
S. Gunderson, CDPHE	S. Surovchak, DOE-RFPO	
S. Johnson, K-H ESS	J. Walstrom, K-H RISS	
M. Keating, K-H RISS	K. Wiemelt, K-H RISS	
L. Kimmel, USEPA	C. Zahm, K-H Legal	
D. Kruchek, CDPHE		

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
ER REGULATORY CONTACT RECORD

Date/Time: October 5, 2005
Site Contact(s): Julie Keating
Phone: 303-966-5205

Regulatory Contact:	Carl Spreng	Raj Goyal	Susan Griffin	Robyn Blackburn
Phone:	303/692-3385	303/692-2634	303/312-6651	303/312-6663
Agency:	CDPHE	CDPHE	USEPA	USFWS Liaison to USEPA

Purpose of Contact: Documentation of Additional Sediment and Surface Water ESLs, Surface soil and Subsurface Soil PRGs, and Volatilization PRGs not included in the CRA Methodology

---

Discussion

During the development of the Comprehensive Risk Assessment (CRA) Work Plan and Methodology (CRA Methodology) (DOE 2004) ecological screening levels (ESLs) and preliminary remediation goals (PRGs) were developed for detected analytes contained in the Soil and Water Database (SWD). Since the publication of the CRA Methodology, it has come to our attention that several analytes with low detection frequencies were not included in the ESL and PRG lists in Appendices A and B of that document.

Tables 1 and 2 list analytes in surface water samples and in sediment samples that have detections and were not included in the original search for ESLs during the development of the CRA Methodology. ESLs were then developed for 24 analytes reported for surface water samples (Table 1) and for 15 analytes reported for sediment samples (Table 2) using the hierarchy of published sources as defined in Appendix B of the CRA Methodology. Toxicity reference values were not available in the published sources for the other analytes listed on Tables 1 and 2 and therefore, ESLs were not developed for those analytes. The surface water ESLs for nitrite and uranium have also been updated (Table 1).

In addition, the manganese ESL for soil for the prairie dog receptor was revised because it was calculated incorrectly in the CRA Methodology. Recalculation of the manganese ESL using the exposure parameters presented in the CRA Methodology results in an ESL of 1519 milligrams per kilogram (mg/kg). In addition, the total PCB ESLs for soil for the kestrel and the total PCBs ESLs and threshold ESLs for the coyote (carnivore and generalist) were revised because they were calculated incorrectly in the CRA Methodology. The soil-to-small mammal BAF is dependent on the soil-to-plant and soil-to-invertebrate BAFs. The soil-to-small mammal BAF presented in the CRA Methodology incorrectly used a soil-to-invertebrate BAF estimated from the log K_{ow} model. This was incorrect because a more appropriate regression-based soil-to-invertebrate BAF was available and should have been chosen for use over the log K_{ow}-based value. Recalculation of the PCB ESLs results in revised ESLs for total PCBs as follows: 0.886 mg/kg for the kestrel; 5.19 mg/kg for the coyote carnivore and 6.04 mg/kg for the threshold ESL for the coyote carnivore, and 3.32 mg/kg for the ESL for the coyote generalist and 3.88 mg/kg for the threshold ESL for the coyote generalist.

Tables 3 and 4 list analytes in surface soil, sediment and subsurface soil samples that have detections and for which PRGs could be developed (i.e., toxicity values were available in the sources defined in the CRA Methodology). PRGs were developed for 10 additional analytes reported for these media (Table 3 and 4) using the sources that are defined in Appendix A of the CRA Methodology.

Tables 5 and 6 list volatile organic compounds (VOCs) in subsurface soil/subsurface sediment and groundwater, respectively, that had detections and for which PRGs could be developed (i.e., those analytes that are included in the Johnson and Ettinger model as described in Appendix A of the CRA Methodology). PRGs were developed for 13 additional VOCs in subsurface soil/subsurface sediment and seven VOCs in groundwater.

These additional ESLs and PRGs have been added to the screening procedure for the CRA.

Reference:
DOE, 2004, Final Comprehensive Risk Assessment Work Plan and Methodology, Rocky Flats Environmental Technology Site, Golden, Colorado, September.

Attachments:
Table 1 Additional Surface Water ESLs not included in the CRA Methodology
Table 2 Additional Sediment ESLs not included in the CRA Methodology
Table 3 Additional Surface Soil PRGs not included in the CRA Methodology
Table 4 Additional Subsurface Soil PRGs not included in the CRA Methodology
Table 5 Additional Subsurface Soil/Subsurface Sediment Volatilization PRGs not included in the CRA Methodology
Table 6 Additional Groundwater Volatilization PRGs not included in the CRA Methodology

---

Contact Record Prepared By: Julie Keating

Required Distribution:

M. Aguilar, USEPA
H. Ainscough, CDPHE
J. Berardini, K-H
B. Birk, DOE-RFPO
L. Brooks, K-H ESS
G. Carnival, K-H RISS
N. Castaneda, DOE-RFPO
C. Deck, K-H Legal
N. Demos, SSOC
S. Garcia, USEPA
S. Gunderson, CDPHE
S. Johnson, K-H ESS
M. Keating, K-H RISS
L. Kimmel, USEPA
D. Kruchek, CDPHE
D. Mayo, K-H RISS
S. Nesta, K-H RISS
L. Norland, K-H RISS
E. Pottorff, CDPHE
A. Primrose, K-H RISS
M. Roy, DOE-RFPO
R. Schassburger, DOE-RFPO
S. Serreze, K-H RISS
D. Shelton, K-H ESS
C. Spreng, CDPHE
S. Surovchak, DOE-RFPO
J. Walstrom, K-H RISS
K. Wiemelt, K-H RISS
C. Zahm, K-H Legal

Additional Distribution:

R. Goyal, CDPHE
R. Blackburn, EPA
S. Griffin, EPA

2416

Table 1
Additional Surface Water ESLs
not included in the CRA Methodology

ECOI	Acute (ug/L)	Chronic (ug/L)	Type of Benchmark (AWQC or Tier II)	Source Benchmark	Notes
1,1,2-Trichloro-1,2,2-trifluoroethane	570	32	Tier II	MIDEQ 2003	
1,1-Dichloropropene	UT	UT			
1,2,3-Trichlorobenzene	UT	8	CWQ	CCME 2002	
1,2,3-Trichloropropane	UT	UT			
1,2,4-Trimethylbenzene	310	17	Tier II	MIDEQ 2003	
1,2-Dibromo-3-chloropropane	UT	UT			
1,2-Dichlorobenzene	240	13	Tier II	MIDEQ 2003	
1,3,5-Trimethylbenzene	810	45	Tier II	MIDEQ 2003	
1,3-Dichlorobenzene	200	28	Tier II	MIDEQ 2003	
2,4,6-Trichlorophenol	79	5	Tier II	MIDEQ 2003	
2-Chloroethyl vinyl ether	UT	UT			
2-Hexanone	1,800	99	Tier II	DOE 1996c	
2-Nitrophenol	UT	UT			
4,4'-DDT	0.55	0.001	AWQC	CDPHE 2002	
4-Bromofluorobenzene	UT	UT			
4-Bromophenyl-phenylether	UT	UT	AWQC	CCME 2002	
4-Chlorotoluene	UT	UT			
4-Isopropyltoluene	UT	UT			
Acenaphthene	1,700	520	AWQC	CDPHE 2002	
Alkalinity	UT	UT			
Ammonia	0.077	0.02	AWQC	CDPHE 2002	
Atraton	UT	UT			
Atrazine	100	7.3	Tier II	MIDEQ 2003	
Benzo(g,h,i)perylene	UT	UT			
Benzyl Alcohol	150	8.6	Tier II	DOE 1996c	
beta-Chlordane	UT	UT			
Bicarbonate	UT	UT			
bis(2-Chloroisopropyl) ether	UT	29	CWQ	CCME 2002	
Boron	31,000	1,900	Tier II	MIDEQ 2003	
Bromide	UT	UT			
Bromochloromethane	UT	UT			
Carbazole	72	4	Tier II	MIDEQ 2003	
Carbonate	UT	UT			
Cerium	UT	UT			
Cesium	UT	UT			
Chloride	860,000	230,000	AWQC	EPA 2002	
Chlorodifluoromethane	UT	UT			
cis-Chlordane	UT	UT			
Dalapon	UT	UT			
Decachlorobiphenyl	UT	UT			
delta-BHC	39	2.2	Tier II	DOE 1996c	Value for BHC Other used.
Dibenz(a,h)anthracene	UT	UT			
Dicamba	UT	10	CWQ	CCME 2002	
Dichlorodifluoromethane	UT	UT			
Dichlorofluoromethane	2,600	150	Tier II	MIDEQ 2003	
Dichloroprop	UT	UT			
Dimethoate	UT	UT			
Dinoseb	9.5	0.48	Tier II	MIDEQ 2003	
Endosulfan I	0.22	0.056	AWQC	EPA 2002	Value for alpha-endosulfan used.
Endrin	0.086	0.036	AWQC	CDPHE 2002	
Heptachlor epoxide	0.52	0.0038	AWQC	CDPHE 2002	
Isopropylbenzene	UT	UT			
Magnesium	UT	UT			
n-Butylbenzene	UT	UT			
Nitrite	8950	4470	AWQC	CDPHE 2002	Updated value, calc. using non-salmonid formula [Cl-] = 22 mg/L
N-Nitrosomorpholine	UT	UT			
n-Propylbenzene	UT	UT			
Ortho-phosphate	UT	UT			
PCB-1254	2	0.014	AWQC	CDPHE 2002	
PCB-1260	2	0.014	AWQC	CDPHE 2002	
Phosphate	UT	UT			
Phosphorus	UT	UT			
Potassium	UT	UT			
Prometon	UT	UT			
sec-Butylbenzene	UT	UT			
Silica	UT	UT			
Silicon	UT	UT			
Simazine	UT	10	CWQ	CCME 2002	
Sodium	UT	UT			
Sulfate	UT	UT			
Sulfide	UT	UT			
Titanium	UT	UT			
trans-1,2-Dichloroethene	28,000	1,500	Tier II	MIDEQ 2003	
Tritium	UT	UT			
Uranium	2402	1501	Teir II	CDPHE 2002	Updated value, hardness dependent = 100 mg/L

NOTES: UT = Uncertain toxicity; AWQC = Ambient Water Quality Criteria, CWQ = Chronic Water Quality

Citations by priority
1) CDPHE 2002
2) EPA 2002
3) MIDEQ 2003
4) CCME 2002
5) DOE 1996c
6) NY State 1998

247

248

Table 2
Additional Sediment ESLs not included in the CRA Methodology

ECOI	Sediment ESL	ESL Reference	Units	Type	Chronic Water ESL (µg/L)	Water ESL Source	Koc	Koc Source
1,2,3-Trichlorobenzene	5.86E+01	EPA 1997b	ug/kg	EqP	8.00E+00	CCME 2002	7.3E+02	EpiWin
1,2,4-Trimethylbenzene	1.22E+02	EPA 1997b	ug/kg	EqP	1.70E+01	MIDEQ 2003	7.2E+02	EpiWin
1,3,5-Trimethylbenzene	3.16E+02	EPA 1997b	ug/kg	EqP	4.50E+01	MIDEQ 2003	7.0E+02	EpiWin
1,3-Dichlorobenzene	1.22E+02	EPA 1997b	ug/kg	EqP	2.80E+01	MIDEQ 2003	4.3E+02	EpiWin
2,4,6-Trichlorophenol	5.93E+01	EPA 1997b	ug/kg	EqP	5.00E+00	MIDEQ 2003	1.2E+03	EpiWin
2-Butanone	8.42E+01	EPA 1997b	ug/kg	EqP	4.00E+04	MIDEQ 2003	2.8E-02	EpiWin
2-Chloroethyl vinyl ether	No Values Available							
2-nitrophenol	No Values Available							
4 Bromofluorobenzene	No Values Available							
4-Bromophenyl-phenylether	1.66E+02	EPA 1997b	ug/kg	EqP	4.00E+00	CCME 2002	4.2E+03	EpiWin
4-Chlorotoluene	No Values Available							
Atrazine	1.68E+01	EPA 1997b	ug/kg	EqP	7.30E+00	MIDEQ 2003	2.3E+02	EpiWin
Benzyl Alcohol	1.35E+00	EPA 1997b	ug/kg	EqP	8.60E+00	ORNL	1.6E+01	EpiWin
Boron	No Values Available							
Calcium	No Values Available							
Cerium	No Values Available							
Cesium	No Values Available							
Chloride	No Values Available							
Chlorodifluoromethane	No Values Available							
Chloroethane	No Values Available							
Chloromethane	No Values Available							
Dibromofluoromethane	No Values Available							
Dichlorodifluoromethane	No Values Available							
Dichlorofluoromethane	5.26E+01	EPA 1997b	ug/kg	EqP	1.50E+02	MIDEQ 2003	3.5E+01	EpiWin
Dieldrin	5.94E+00	EPA 1997b	ug/kg	EqP	5.60E-02	CDPHE 2003	1.1E+04	EpiWin
Dioxin (TEQ Total)	8.50E-03	CCME 2002	ug/kg	ISQG	NA			
Ethylbenzene	1.66E+04	EPA 1997b	ug/kg	EqP	3.20E+03	CDPHE 2003	5.2E+02	EpiWin
Isopropylbenzene	No Values Available							
n-butylbenzene	No Values Available							
n-propylbenzene	No Values Available							
ortho-phosphate	No Values Available							
Phosphorus	600	MacDonald et al. 1999	mg/kg	LEL	NA			
Potassium	No Values Available							
sec-butylbenzene	No Values Available							
Sodium	No Values Available							
Sulfate	No Values Available							
Sulfide	No Values Available							
Titanium	No Values Available							
trans-1,2-Dichloroethene	6.57E+02	EPA 1997b	ug/kg	EqP	1,500.00	MIDEQ 2003	4.4E+01	EpiWin

NOTE: The water ESLs used to calculate EqP-based ESLs are chronic values.
EpiWin - Part of Epi Suite, developed by EPA, Office of Pollution Prevention Toxics and Syracuse Research Corporation, copyright 2000, EPA.

Table 3
Additional Surface Soil PRGs
not included in the CRA Methodology

WRW Surface Soil PRGs at Risk = 1E-06 and HQ = 0.1					
Target Analyte List	Volatile?	CAS Number	WRW Noncarcinogenic Soil PRG HQ = 0.1	WRW Carcinogenic Soil PRG Risk = 1E-06	WRW Soil PRG Risk = 1E-06 or HQ = 0.1
			(mg/kg)	(mg/kg)	(mg/kg)
2-Chlorotoluene	V	95-49-8	2221.74		2221.74
1,2,4-Trimethylbenzene	V	95-63-6	132.62		132.62
1,3,5-Trimethylbenzene	V	108-67-8	114.34		114.34
2,4,5-T		93-76-5	801.44		801.44
Tetraethyl dithiopyrophosphate		3689-24-5	40.07		40.07
1,2-Dichloroethene (cis-)	V	156-59-2	1110.87		1110.87
1,2-Dichloroethene (trans-)	V	156-60-5	287.34		287.34
			(pCi/g)	(pCi/g)	(pCi/g)
Cs-134		013967-70-9		0.08	0.08
Cm-244		013981-15-2		8.63	8.63
Pu-241		014119-32-5		520.08	520.08
Cm-245/246		015621-76-8		1.80	1.80
Pu-242		13982-10-0		6.24	6.24
U-232		14158-29-3		3.61	3.61

249

Table 4
Additional Subsurface Soil PRGs
not included in the CRA Methodology

WRW Subsurface Soil PRGs at Risk = 1E-06 and HQ = 0.1					
Target Analyte List	Volatile?	CAS Number	WRW Noncarcinogenic Subsurface Soil PRG HQ = 0.1	WRW Carcinogenic Subsurface Soil PRG Risk = 1E-06	WRW Soil PRG Subsurface Risk = 1E-06 or HQ = 0.1
			(mg/kg)	(mg/kg)	(mg/kg)
2-Chlorotoluene	V	95-49-8	25550.00		25550.00
1,2,4-Trimethylbenzene	V	95-63-6	1525.13		1525.13
1,3,5-Trimethylbenzene	V	108-67-8	1314.89		1314.89
2,4,5-T		93-76-5	9216.51		9216.51
Tetraethyl dithiopyrophosphate		3689-24-5	460.83		460.83
1,2-Dichloroethene (cis-)	V	156-59-2	12775.00		12775.00
1,2-Dichloroethene (trans-)	V	156-60-5	3304.44		3304.44
			(pCi/g)	(pCi/g)	(pCi/g)
Cs-134		013967-70-9		0.91	0.91
Cm-244		013981-15-2		99.27	99.27
Pu-241		014119-32-5		5980.92	5980.92
Cm-245/246		015621-76-8		20.69	20.69
Pu-242		13982-10-0		71.82	71.82
U-232		14158-29-3		41.49	41.49

Table 6
Additional Groundwater Volatilization PRGs
not included in the CRA Methodology

WRW Groundwater Volatilization PRGs at Risk = 1E-06 and HQ = 0.1					
Target Analyte List	Volatile?	CAS Number	WRW Noncarcinogenic Groundwater PRG HQ = 0.1	WRW Carcinogenic Groundwater PRG Risk = 1E-06	WRW Soil PRG Groundwater = 1E-06 or HQ = 0.1
			(ug/L)	(ug/L)	(ug/L)
1,2,4-Trimethylbenzene	V	95-63-6	5.49E+02		5.49E+02
1,3,5-Trimethylbenzene	V	108-67-8	5.51E+00		5.51E+02
1,2-Dichloroethene (cis-)	V	156-59-2	2.96E+03		2.96E+03
1,2-Dichloroethene (trans-)	V	156-60-5	3.23E+03		3.23E+03
4-Methyl-2-pentanone	V	108-10-1	6.42E+06		6.42E+06
Chloromethane	V	74-87-3	4.73E+03	1.97E+03	1.97E+03
Dibromomethane	V	74-95-3	1.35E+04		1.35E+04

252

Attachments

Title	COPEC	Class	Study Species	Contaminant Form	Data Source	Contaminant Form	Test Substrate	Dose Quantification	Dose Range	Dose Route	Endpoint	Exposure Duration	Statistical Power	Test Comnditions	Sum Score	Use
Abdo et al. 1984	Hexachlorocyclopentadiene	Mammal	Mouse	Hexachlorocyclopentadiene	10	10	10	10	10	8	9	10	10	10	97	Yes
Alvarez et al. 2000	Hexachlorobenzene	Mammal	Rat	Hexachlorobenzene	10	10	10	10	4	8	4	6	1	10	73	Yes
American Cyanamid 1979	Pendamethiline	Mammal	Dog	Pendamethiline	0	10	0	10	8	8	4	10	10	10	70	Yes
American Cyanamid 1986	Dimethoate	Mammal	Rat	Dimethoate	0	0	0	5	10	10	9	10	10	10	64	No
Argus Lab 1997	Phenol	Mammal	Rat	Phenol	0	10	10	10	10	8	10	10	10	10	88	Yes
Arnold et al. 1985	Hexachlorobenzene	Mammal	Rat	Hexachlorobenzene	10	10	10	5	10	10	9	10	1	10	85	Yes
Barnes et al. 1985	trans-1,2-Dichloroethene	Mammal	Mouse	trans-1,2-Dichloroethene	10	10	5	10	10	5	4	10	10	10	84	Yes
Belpoggi et al. 1995	Methyl-tert-butyl Ether	Mammal	Rat	Methyl-tert-butyl Ether	0	10	10	10	4	8	10	10	1	0	63	No
Blackburn et al. 1986	2,4,6 Trichlorophenol	Mammal	Rat	2,4,6-Trichlorophenol	0	10	10	10	4	8	10	6	10	7	75	Yes
Borzelleca et al. 1964	Methyl Methacrylate	Mammal	Rat	Methyl Methacrylate	10	10	10	7	4	5	9	10	1	10	76	Yes
Bruckner et al. 1989	1,2-Dichloropropane	Mammal	Rat	1,2-Dichloropropane	10	10	10	10	10	8	9	10	10	10	97	Yes
Cabral et al. 1979	Hexachlorobenzene	Mammal	Rat	Hexachlorobenzene	10	10	10	5	10	8	9	10	10	10	92	Yes
Chu et al. 1984	1,2,4,5 Tetrachlorobenzene	Mammal	Rat	1,2,4,5 Tetrachlorobenzene	10	10	10	10	8	10	4	10	10	7	89	Yes
Courtney et al. 1976	Hexachlorobenzene	Mammal	Rat	Hexachlorobenzene	10	10	10	10	4	8	10	10	1	10	83	Yes
Danse et al. 1984	Bromomethane	Mammal	Rat	Bromomethane	10	10	10	10	8	10	4	10	10	10	92	Yes
Den Tonkelaar et al. 1983	4,6 - Dinitro o Cresel	Mammal	Mouse	4,6 - Dinitro o Cresel	0	10	0	0	10	10	10	10	10	7	67	Yes
Dilley et al. 1982	2,4,6-Trinitrotoluenen	Mammal	Rat	2,4,6-Trinitrotoluenen	10	10	10	10	10	10	10	10	10	10	100	Yes
DOD 1981	2,4,6-Trinitrotoluene	Mammal	Rat	2,4,6-Trinitrotoluene	0	10	10	0	10	10	10	10	10	10	80	Yes
DOD 1985a	HMX	Mammal	Rat	HMX	0	10	10	10	10	10	8	10	10	10	88	Yes
Dow Chemical Co. 1959	Heptachlor epoxide	Mammal	Rat	Heptachlor epoxide	0	10	0	10	10	0	10	10	10	10	70	Yes
EPA 1986a	Ethyl Actetate	Mammal	Rat	Ethyl Actetate	0	10	10	10	10	8	8	10	10	10	86	Yes
EPA 1986b	2-Methylphenol (o-cresol)	Mammal	Rat	2-Methylphenol (o-cresol)	0	10	0	0	8	8	4	10	10	0	50	No
EPA 1986d	Diethyl Ether	Mammal	Rat	Diethyl Ether	0	10	10	10	10	8	8	10	10	10	86	Yes
EPA 1987	4-Methylphenol (p-cresol)	Mammal	Rat	4-Methylphenol (p-cresol)	0	10	0	0	8	8	4	10	10	0	50	No
EPA 1989a	Acenaphthene	Mammal	Mouse	Acenaphthene	0	10	10	10	4	8	9	10	1	10	72	Yes
EPA 1989b	Fluoranthene	Mammal	Mouse	Fluoranthene	0	10	10	10	4	8	9	10	1	10	72	Yes
EPA 1989d	2-Chloronapthalene	Mammal	Mouse	2-Chloronaphthalene	0	10	0	0	10	10	9	10	10	7	66	Yes
EPA 1989e	Fluorene	Mammal	Mouse	Fluorene	0	10	10	10	10	8	4	10	10	10	82	Yes
EPA 1989e	Anthracene	Mammal	Mouse	Anthracene	0	10	10	10	4	8	9	10	1	10	72	Yes
EPA 2003c	Benzene, 1,2,4-Trimethyl	Mammal	Rat	Benzene, 1,2,4-Trimethyl	0	10	10	10	8	8	9	6	10	10	81	Yes
Exon and Kohler 1982	2 Chlorophenol	Mammal	Rat	2 Chlorophenol	10	10	10	5	8	5	10	10	10	2	80	Yes
Exon and Kohler 1985	2,4 Dichlorophenol	Mammal	Rat	2,4 Dichlorophenol	0	10	10	5	8	5	10	10	10	2	70	Yes
Exon and Kohler 1985	2,4,6 Trichlorophenol	Mammal	Rat	2,4,6-Trichlorophenol	0	10	10	5	8	5	10	10	10	2	70	Yes
Giavini et al. 1985 per RWQCB 2001	1,4-Dioxane	Mammal	Rat	1,4-Dioxane	0	10	10	10	10	8	10	10	10	0	78	Yes
Giavini et al. 1986	1,4-Dichlorobenzene (p-)	Mammal	Rat	1,4-Dichlorobenzene (p-)	10	10	10	10	10	8	10	10	10	10	98	Yes
Gibson 1973	2,4 Dinitrophenol	Mammal	Mouse	2,4 Dinitrophenol	10	10	10	10	4	8	10	10	1	7	80	Yes
Gorzinski et al. 1985	Hexachloroethane	Mammal	Rat	Hexachloroethane	10	10	10	10	10	10	4	10	10	10	94	Yes
Grant et al. 1977	Hexachlorobenzene	Mammal	Rat	Hexachlorobenzene	10	10	10	5	10	8	10	10	10	10	93	Yes
Gray et al. 1999	4,4-DDE	Mammal	Rat	4,4-DDE	0	10	0	10	4	8	10	10	10	0	62	No
Hardin et al. 1987	Benzyl Alcohol	Mammal	Mouse	Benzyl Alcohol	10	10	10	10	4	8	9	10	10	10	91	Yes
Hardin et al. 1987	Dimethylphthalate	Mammal	Mouse	Dimethylphthalate	10	10	10	10	10	8	9	10	10	10	97	Yes
Hardin et al. 1987	Di-n-octylphthalate	Mammal	Mouse	Di-n-octylphthalate	10	10	10	10	4	8	10	10	10	10	92	Yes
Harleman and Seinen 1979	Hexachlorobutadiene	Mammal	Rat	Hexachlorobutadiene	10	10	5	7	8	8	10	6	10	10	84	Yes
Haseltine et al. 1980	Toxaphene	Bird	Black Duck	Toxaphene	10	10	10	6	8	10	10	10	10	10	94	Yes
Haut et al. 1996	cis/trans-1,3-Dichloropropene	Mammal	Rat	cis/trans-1,3-Dichloropropene	10	10	10	10	10	10	8	10	10	10	98	Yes
Haut et al. 1996	cis/trans-1,3-Dichloropropene	Mammal	Mouse	cis/trans-1,3-Dichloropropene	10	10	10	10	10	10	8	10	10	10	98	Yes
Hayes et al. 1987	trans-1,2-Dichloroethene	Mammal	Rat	trans-1,2-Dichloroethene	0	10	0	0	10	5	4	10	10	0	49	No
Hazelton 1989	4-Nitrophenol	Mammal	Rat	4-Nitrophenol	0	10	0	10	10	8	9	10	10	0	67	Yes
Heindel et al. 1989	Di-n-octylphthalate	Mammal	Mouse	Di-n-octylphthalate	10	10	10	10	4	10	10	10	10	10	94	Yes
Heindel et al, 1989; Morrisey et al, 1989; NTP, 1985d	Di-n-octylphthalate	Mammal	Mouse	Di-n-octylphthalate	10	10	10	10	4	10	10	10	1	10	85	Yes
HEW 1979	1,3-Isobenzofurandione	Mammal	F344 Rat	1,3-Isobenzofurandione	10	10	10	5	4	10	9	10	1	10	79	Yes
HEW 1979	1,3-Isobenzofurandione	Mammal	B6C3F1 Mouse	1,3-Isobenzofurandione	10	10	10	5	4	10	8	10	10	10	87	Yes
Hoechst 1984	Trifluralin	Mammal	Dog	Trifluralin	0	10	0	5	10	10	8	10	10	10	73	Yes
Hong et al. 1985	2,4-Dinitrotoluene	Mammal	Mouse	2,4-Dinitrotoluene	10	10	10	10	10	10	10	10	10	10	100	Yes
EPA 1989c	Pyrene	Mammal	Mouse	Pyrene	0	10	10	10	4	8	9	10	1	10	72	Yes
Ito et al. 1973	alpha-BHC	Mammal	Mouse	alpha-BHC	10	10	10	0	0	10	4	10	10	10	74	Yes
Jiang et al. 1991	2,4,6-Trinitrotoluene	Mammal	Rat	2,4,6-Trinitrotoluene	10	10	10	10	4	8	10	10	10	10	92	Yes
Jones-Price 1984	Carbon disulfide	Mammal	Rat	Carbon disulfide	0	10	10	10	10	8	10	10	10	10	88	Yes
Jones-Price et al. 1983	Phenol	Mammal	Mouse	Phenol	0	10	0	0	10	8	10	10	10	0	58	No
Kavlock et al. 1967	Multiple	Mammal	Mouse	Multiple	10	10	10	10	10	8	10	10	10	7	95	Yes
Kelce et al. 1995	4,4-DDE	Mammal	Rat	4,4-DDE	10	10	10	10	4	8	10	10	10	10	92	Yes
Kelce et al. 1998' 1997	4,4-DDE	Mammal	Rat	4,4-DDE	10	10	10	10	4	8	10	6	10	10	88	Yes
Khera and Villeneuve 1975	Variuos Halgenated Benzenes	Mammal	Rat	Variuos Halgenated Benzenes	10	10	10	10	4	8	10	10	1	7	80	Yes
Kimmerle and Klimmer 1974	Sulfotep	Mammal	Rat- Wistar male	Sulfotep	10	10	10	5	4	10	1	10	1	10	71	Yes
Kirk et al. 1989	1,2-Dichloropropane	Mammal	Rat	1,2-Dichloropropane	0	10	0	10	4	8	10	10	10	0	62	No
Kirk et al. 1990	1,2-Dichloropropane	Mammal	Rat	1,2-Dichloropropane	0	10	0	0	0	5	10	10	10	10	55	No

252

Attachment 1
Scoring of Primary Toxicity Reference Values Sources

Title	COPEC	Class	Study Species	Contaminant Form	Data Source	Contaminant Form	Test Substrate	Dose Quantification	Dose Range	Dose Route	Endpoint	Exposure Duration	Statistical Power	Test Comnditions	Sum Score	Use
Klaunig et al. 1986	1,1-Dichloroethane	Mammal	Mouse	1,1-Dichloroethane	0	10	0	0	4	5	4	10	1	0	34	No
Kociba et al. 1977a	Hexachlorobutadiene	Mammal	Rat	Hexachlorobutadiene	10	10	5	10	10	10	10	10	10	10	95	Yes
Kociba et al. 1977b	Hexachlorobutadiene	Mammal	Rat	Hexachlorobutadiene	10	10	10	10	10	10	10	10	10	10	100	Yes
Kociba et al. 1974	1,4-Dioxane	Mammal	Rat	1,4-Dioxane	10	10	10	10	10	5	9	10	10	10	94	Yes
Kociba et al. 1979	2,4,5-Trichlorophenoxyacetic Acid	Mammal	Rat	2,4,5-Trichlorophenoxyacetic Acid	10	10	10	10	10	10	8	10	10	10	98	Yes
Lane et al. 1985	2,4-Dinitrotoluene	Mammal	Rat	2,4-Dinitrotoluene	10	10	10	10	10	8	10	10	10	10	98	Yes
Lee et al. 1976	2,6-Dinitrotoluene	Mammal	Rat	2,6-Dinitrotoluene	0	10	0	5	8	10	10	10	10	10	73	Yes
Lee et al. 1976	2,6-Dinitrotoluene	Mammal	Mouse	2,6-Dinitrotoluene	0	10	0	5	8	10	10	10	10	10	73	Yes
Lee et al. 1978, Ellis et al. 1979	2,4-Dinitrotoluene	Mammal	Rat	2,4-Dinitrotoluene	10	10	10	10	10	10	10	10	10	10	100	Yes
Lee et al. 1985	2,4-Dinitrotoluene	Mammal	Rat	2,4-Dinitrotoluene	10	10	10	10	10	10	10	10	10	10	100	Yes
Lijinsky and Reuber 1983	n-Nitrosodipropylamine	Mammal	Rat	n-Nitrosodipropylamine	0	10	0	0	4	0	9	10	10	0	43	No
Lijinsky and Taylor 1979	n-Nitrosodipropylamine	Mammal	Rat	n-Nitrosodipropylamine	10	10	10	6	4	5	9	10	10	10	84	Yes
Linder et al. 1980	Pentachlorobenzene	Mammal	Rat	Pentachlorobenzene	10	10	10	7	10	10	10	10	10	10	97	Yes
Loeffler and Peterson 1999	4,4-DDE	Mammal	Rat	4,4-DDE	10	10	10	10	10	8	10	10	10	10	98	Yes
Mann et al. 1985	Di-n-octylphthalate	Mammal	Rat	Di-n-octylphthalate	10	10	10	5	4	10	10	3	1	10	73	Yes
Matuk et al. 1981	Silver	Mammal	Rat	Silver	0	0	0	0	4	5	8	10	10	0	37	No
McCauley et al. 1990	cis-1,2-Dichloroethene	Mammal	Rat	cis-1,2-Dichloroethene	0	10	10	10	10	8	8	10	10	4	80	Yes
McCollister et al. 1961	2,4,5 - Trichlorophenol	Mammal	Rodent	2,4,5-Trichlorophenol	0	10	10	10	10	10	10	6	10	2	78	Yes
Minana et al. 1995	Ammonium (as Ammonia)	Mammal	Rat	Ammonium (as Ammonia)	10	10	10	5	4	10	8	10	1	10	78	Yes
Mitsumori et al. 1979	Bis(2-chloroisopropyl)ether	Mammal	Mouse	Bis(2-chloroisopropyl)ether	0	10	0	10	8	10	4	10	10	7	69	Yes
Monsanto 1980	4-Nitroaniline	Mammal	Rat	4-Nitroaniline	0	10	10	10	10	8	10	10	10	10	88	Yes
Monsanto 1985	2-nitroaniline	Mammal	Rat	2-nitroaniline	0	10	10	10	10	8	10	10	10	10	88	Yes
Murata et al. 1993	1-Methylnaphthalene	Mammal	Mouse	1-Methylnaphthalene	10	10	5	10	4	10	9	10	1	10	79	Yes
Murata et al. 1997	2-Methylnaphthalene	Mammal	Mouse	2-Methylnaphthalene	10	10	10	10	4	10	9	10	1	10	84	Yes
Murray et al. 1978	Styrene	Mammal	Mouse	Styrene	10	10	10	10	4	8	10	10	1	10	83	Yes
Nair et al. 1990	4-Nitroaniline	Mammal	Rat	4-Nitroaniline	0	10	10	10	10	8	4	10	10	10	82	Yes
Narotsky and Kavlock 1995	Phenol	Mammal	Rat	Phenol	10	10	10	10	10	8	10	10	10	10	98	Yes
NCI 1977	1,1-Dichloroethane	Mammal	Rat	1,1-Dichloroethane	10	10	10	10	4	8	9	10	10	10	91	Yes
NCI 1977	1,1-Dichloroethane	Mammal	Mouse	1,1-Dichloroethane	10	10	10	10	10	8	9	10	10	10	97	Yes
NCI 1977	1,1-Dichloroethane	Mammal	Rat	1,1-Dichloroethane	10	10	10	10	4	10	9	10	10	10	93	Yes
NCI 1978d	1,1,2,2 Tetrachloroethane	Mammal	Rat/Mouse	1,1,2,2 Tetrachloroethane	0	10	5	10	4	8	10	10	10	2	69	Yes
NCI 1978b	1,4-Dioxane	Mammal	Rat	1,4-Dioxane	10	10	10	10	4	5	9	10	10	10	88	Yes
NCI 1978b	1,4-Dioxane	Mammal	Mouse	1,4-Dioxane	10	10	10	10	4	5	9	10	10	10	88	Yes
NCI 1978c	4,4-DDD	Mammal	Mouse	4,4-DDD	10	10	10	5	4	10	9	10	1	10	79	Yes
NCI 1978c	4,4-DDD	Mammal	Rat	4,4-DDD	10	10	10	5	4	10	9	10	1	10	79	Yes
NCI 1978c	4,4-DDD	Mammal	Mouse	4,4-DDD	10	10	10	5	4	10	9	10	1	10	79	Yes
NCI 1978c	4,4-DDD	Mammal	Rat	4,4-DDD	10	10	10	5	4	10	9	10	1	10	79	Yes
NCI 1978c	4,4-DDE	Mammal	Mouse	4,4-DDE	10	10	10	5	10	10	9	10	10	10	94	Yes
NCI 1978c	4,4-DDE	Mammal	Ra	4,4-DDE	10	10	10	0	0	10	9	10	10	10	79	Yes
NCI 1979b	4-Chloroaniline	Mammal	Rat	4-Chloroaniline	0	10	0	0	10	10	9	10	10	7	66	Yes
NCI 1979a	n-Nitrosodiphenylamine	Mammal	Rat	n-Nitrosodiphenylamine	10	10	10	6	10	10	9	10	10	10	95	Yes
NCI 1979a	n-Nitrosodiphenylamine	Mammal	Mouse	n-Nitrosodiphenylamine	10	10	10	6	4	10	8	10	10	10	88	Yes
NCI 1978e	Trichlorofluoromethane	Mammal	Rat And Mouse	Trichlorofluoromethane	0	10	0	5	4	8	9	10	1	10	57	No
Nor-Am Agricultural Products 1972	Isophorone	Mammal	Dog	Isophorone	0	10	0	10	4	8	4	6	1	0	43	No
NTP 1978	Hexachloroethane	Mammal	Rat	Hexachloroethane	10	10	10	10	4	8	9	10	10	10	91	Yes
NTP 1983b	1,1,2,2-Tetrachloroethane	Mammal	Rat	1,1,2,2-Tetrachloroethane	0	10	10	10	10	8	9	10	9	10	86	Yes
NTP 1983a	1,2,3-Trichloropropane	Mammal	Rat	1,2,3-Trichloropropane	0	10	10	10	10	8	9	10	10	10	87	Yes
NTP 1983a	1,2,3-Trichloropropane	Mammal	Mouse	1,2,3-Trichloropropane	0	10	10	10	10	8	4	10	10	10	82	Yes
NTP 1983a	Butylbenzylphthalate	Mammal	Rat	Butylbenzylphthalate	0	10	10	10	10	10	10	10	10	10	90	Yes
NTP 1985b	Chlorobenzene	Mammal	Mouse	Chlorobenzene	10	10	10	10	4	8	9	10	1	10	82	Yes
NTP 1985b	Chlorobenzene	Mammal	Rat	Chlorobenzene	10	10	10	10	10	8	9	10	10	10	97	Yes
NTP 1985c	cis/trans-1,3-Dichloropropene	Mammal	Mouse	cis/trans-1,3-Dichloropropene	10	10	10	10	10	8	9	10	10	10	97	Yes
NTP 1986a	1,2-Dichloropropane	Mammal	Rat	1,2-Dichloropropane	10	10	10	10	10	8	9	10	10	10	97	Yes
NTP 1986a	1,2-Dichloropropane	Mammal	Mouse	1,2-Dichloropropane	10	10	10	10	10	8	9	10	10		87	Yes
NTP 1986b	Isophorone	Mammal	Rat	Isophorone	10	10	10	10	10	8	9	10	10	10	97	Yes
NTP 1987	1,4-Dichlorobenzene (p-)	Mammal	Mouse	1,4-Dichlorobenzene (p-)	10	10	10	10	10	8	10	10	10	10	98	Yes
NTP 1987	1,4-Dichlorobenzene (p-)	Mammal	Rat	1,4-Dichlorobenzene (p-)	10	10	10	10	10	8	9	10	10		87	Yes
NTP 1989a	Hexachloroethane	Mammal	Rat	Hexachloroethane	10	10	10	10	10	8	8	10	10	10	96	Yes
NTP 1993	4-Nitroaniline	Mammal	Mouse	4-Nitroaniline	0	10	10	10	4	8	9	10	1	10	72	Yes
NTP 2001	p-Nitrotoluene	Mammal	Rat	p-Nitrotoluene	0	10	10	10	10	10	10	10	10	10	90	Yes
NTP 2001	p-Nitrotoluene	Mammal	Mouse	p-Nitrotoluene	0	10	10	10	4	10	9	10	1	10	74	Yes
Olin Mathieson Chemical Corporation 1968a	Pentachloronitrobenzene	Mammal	Dog	Pentachloronitrobenzene	0	10	10	5	10	10	4	10	10	10	79	Yes
Olin Mathieson Chemical Corporation 1968b	Pentachloronitrobenzene	Mammal	Rat	Pentachloronitrobenzene	0	10	10	0	4	0	10	10	1	10	55	No
Peon et al. 1995	Di-n-octylphthalate	Mammal	Rat	Di-n-octylphthalate	0	10	0	0	4	10	10	10	1	0	45	No
Plasterer et al. 1985	4-Nitrophenol	Mammal	Mouse	4-Nitrophenol	10	10	10	10	4	8	10	10	1	10	83	Yes
Plasterer et al. 1985	Dimethylphthalate	Mammal	Mouse	Dimethylphthalate	10	10	10	10	4	8	10	10	1	10	83	Yes

253

Attachment 1
Scoring of Primary Toxicity Reference Values Sources

Title	COPEC	Class	Study Species	Contaminant Form	Data Source	Contaminant Form	Test Substrate	Dose Quantification	Dose Range	Dose Route	Endpoint	Exposure Duration	Statistical Power	Test Comnditions	Sum Score	Use
Research Triangle Institute 1986	2,3,4,6-Tetrachlorophenol	Mammal	Rat	2,3,4,6-Tetrachlorophenol	0	10	10	10	10	8	10	10	10	10	88	Yes
Rhodia 1969	4-(2,4-Dichlorophenoxy) Butyric Acid (2,4-DB)	Mammal	Dog	-Dichlorophenoxy) Butyric Acid (2	0	10	10	0	10	10	10	6	10	10	76	Yes
Robinson et al. 1981	1,2,4-Trichlorobenzene	Mammal	Rat	1,2,4-Trichlorobenzene	10	10	10	10	10	5	4	10	10	10	89	Yes
Robinson et al. 1990	Methyl-tert-butyl Ether	Mammal	Rat	Methyl-tert-butyl Ether	0	10	10	10	4	8	10	10	1	0	63	No
Rodwell et al. 1989	2,4 Dichlorophenol	Mammal	Rat	2,4 Dichlorophenol	10	10	10	10	10	8	10	6	10	10	94	Yes
Ruddick et al. 1983	Bromodichloromethane	Mammal	Rat	Bromodichloromethane	10	10	10	10	10	10	8	10	10	10	98	Yes
Rungby and Danscher 1984	Silver	Mammal	Rat	Silver	0	0	0	0	4	5	4	10	10	0	33	No
Schroter et al. 1987	alpha-BHC	Mammal	Rat	alpha-BHC	10	10	10	10	10	10	4	10	10	10	94	Yes
Schulte-Hermann and Parzefall. 1981	alpha-BHC	Mammal	Rat	alpha-BHC	10	10	10	10	4	10	8	10	10	10	92	Yes
Schwetz et al. 1977	Hexachlorobutadiene	Mammal	Rat	Hexachlorobutadiene	10	10	10	10	10	10	10	10	10	10	100	Yes
Seidenberg et al. 1986	1,1,2 Trichloroethane	Mammal	Mouse	1,1,2 Trichloroethane	10	10	10	10	4	8	9	10	1	10	82	Yes
Seyler et al. 1984	2,4 Dichlorophenol	Mammal	Mouse	2,4 Dichlorophenol	10	10	5	10	4	5	10	6	1	10	71	Yes
Sherman 1974	Dichlorodifluoromehtane	Mammal	Rat	Dichlorodifluoromehtane	0	10	10	6	8	10	8	10	10	10	82	Yes
Shimizu et al. 1992	Hexachloroethane	Mammal	Rat	Hexachloroethane	0	10	0	10	10	8	10	10	10	0	68	Yes
Shopp et al. 1985	trans-1,2-Dichloroethene	Mammal	Mouse	trans-1,2-Dichloroethene	10	10	5	10	4	5	4	10	1	10	69	Yes
Simon et al. 1979	Hexachlorobenzene	Mammal	Rat	Hexachlorobenzene	10	10	5	10	8	8	10	10	10	10	91	Yes
Smith et al. 1979	2,4,5-Trichlorophenoxyacetic Acid	Mammal	Rat	2,4,5-Trichlorophenoxyacetic Acid	10	10	10	10	10	10	10	10	10	10	100	Yes
Spencer et al. 1948	2,4 Dinitrophenol	Mammal	Rat	2,4 Dinitrophenol	0	10	0	0	8	10	10	10	10	7	65	Yes
Srivastava et al. 1989	Styrene	Mammal	Rat	Styrene	10	10	10	10	10	8	10	10	10	10	98	Yes
Stula et al. 1975	3,3-Dichlorobenzidine	Mammal	Rat	3,3-Dichlorobenzidine	10	10	5	5	4	10	9	10	1	10	74	Yes
Tainter 1938	2,4 Dinitrophenol	Mammal	Rat	2,4 Dinitrophenol	10	10	5	6	10	10	10	10	10	7	88	Yes
Thomas et al. 1940	Dibenzofuran	Mammal	Rat	Dibenzofuran	0	10	5	5	10	10	4	10	10	4	68	Yes
Tryphonas & Iverson 1983	alpha-BHC	Mammal	Mouse	alpha-BHC	10	10	10	5	4	10	4	10	10	10	83	Yes
Tsuda et al. 1982	Carbazole	Mammal	Mouse	Carbazole	10	10	10	10	4	10	9	10	10	10	93	Yes
Velsicol 1973	Heptachlor epoxide	Mammal	Dog	Heptachlor epoxide	0	10	0	10	10	0	10	10	10	10	70	Yes
Velsicol 1978	Dicamba	Mammal	rabbit	Dicamba	0	10	0	10	10	8	10	10	10	10	78	Yes
Vesicol 1981	Dicamba	Mammal	Rat	Dicamba	0	10	0	5	10	0	10	10	10	0	55	No
Vesicol 1985	Dicamba	Mammal	Rat	Dicamba	0	10	0	5	4	10	4	10	1	0	44	No
Weeks et al. 1979	Hexachloroethane	Mammal	Rat	Hexachloroethane	10	10	10	10	10	8	10	10	10	10	98	Yes
Weisburger et al. 1981	Bis(2-chloroethyl)ether	Mammal	Rat	Bis(2-chloroethyl)ether	10	10	10	5	10	10	9	10	10	10	94	Yes
Wolf et al. 1956	Ethylbenzene	Mammal	Rat	Ethylbenzene	0	10	10	10	10	8	4	10	10	7	79	Yes
Wolf et al. 1956	Isopropyl Benzene	Mammal	Rat(female)	Isopropyl Benzene	0	10	10	10	10	8	1	10	10	7	76	Yes
You et al. 1998	4,4-DDE	Mammal	Rat	4,4-DDE	10	10	10	10	10	8	10	10	10	10	98	Yes

Note: The scores provided are based on the most sensitive endpoints within each study provided in Attachment 2

254

Attachment 2
Toxicity Data Used To Derive NOAEL and Threshold Toxicity Reference Values

Analyte	Test Species	Route of Exposure	Vehicle of Administration	Duration of Exposure	Life Stage Test Species	Endpoint	Duration	Units presented in paper (mg/kg-day unless otherwise noted)	Study NOAEL (mg/kg) If Units Must Be Converted	Study LOAEL (mg/kg) If Units Must Be Converted	Body Weight Test Species (kg)	Ingestion Rate Test Species (g/day)	Body Weight and Ingestion Rate Reference	NOAEL (mg/kgday)	LOAEL (mg/kgday)	Effects	LOAEL ECx	Notes	Reference citation
1,4-Dioxane	Mouse	Oral	Water	2 Years	Adult	Mortality	Chronic				NA	NA	NA	–	380	Increase in Mortality	EC10 (5% Mortality in the control vs. 15% mortality at the LOAEL @ 80 weeks)		NCI 1978b
1,4-Dioxane	Rat	Oral	Water	2 Years	Adult	Mortality	Chronic				NA	NA	NA	94(M); 148(F)	1015(M); 1599(F)	Decreased Survival and Increased Mortality	Range of EC30-EC35 @1 year; EC35 to EC50 @2 years		Kociba et al. 1974
Ethyl Acetate	Rat	Gavage	Not specified	90 Days	Adult	Mortality	Chronic				NA	NA	NA	900	3600	Decreased Survival	Percentage of test group affected not known.		EPA 1986a
Ethyl Acetate	Rat	Gavage	Not Specified	90 Days	Adult	Growth	Chronic				NA	NA	NA	900	3600	Decreased Body Weight	Percentage of test group affected not known.		EPA 1986a
Ethylbenzene	Rat	Gavage	Oil	182 day - 5 Days/Week	Adult	Systemic	Chronic				NA	NA	NA	97	291	Increase in Liver and Kidney weight	Percentage of test group affected not known.		Wolf et al. 1956
Ethyl Ether (diethyl ether)	Rat	Gavage		13 Weeks	Adult	Growth	Chronic							500	2000	Decrease in Male Body Weight.	Percentage of test group affected not known.		EPA 1986d
Fluoranthene	Mouse	Gavage	Oil	90 Days	Adult	Mortality	Chronic				NA	NA	NA	500	–	No Effects Noted	NOAEL only		EPA 1989b
Fluoranthene	Mouse	Gavage	Oil	90 Days	Adult	Systemic	Chronic				NA	NA	NA	125	250	Increased Liver Weight and Hematological Changes	Percentage of test group affected not known.		EPA 1989b
Fluorene	Mouse	Gavage	Oil	90 Days	Adult	Systemic	Chronic				NA	NA	NA	250	500	Multiple Non-Mortality Effects	Percentage of test group affected not known.		EPA 1989b
Heptachlor epoxide	Rat	Unknown	Unknown	3 Generations	3 Generations	Developmental	Chronic				NA	NA	NA	0.25	0.5	Increase in Pup Mortality	Percentage of test group affected not known.		Dow 1959
Heptachlor epoxide	Dog	Unknown	Unknown	2 Generations	2 Generations	Developmental	Chronic				NA	NA	NA	0.125	0.175	Increase in Pup Mortality	Percentage of test group affected not known.		Velsicol 1973
Hexachlorobenzene	Rat	Gavage	Oil	5 Days	Adult	Reproduction	Acute-Reproduction							70	221	Decrease in Impregnation Rates by Males	Percentage of test group affected not known.		Simon et al. 1979
Hexachlorobenzene	Mouse	Gavage	Oil	Gestational Days 7 - 16	Fetus	Developmental	Acute-Developmental							–	100	Increase in Fetal Abnormalities	Percentage of test group affected not known.		Courtney et al. 1976
Hexachlorobenzene	Rat	Oral	Food	4 Generations	Adult	Reproduction	Chronic							8	16	Decrease in Fertility and Litter Size	Percentage of test group affected not known.		Grant et al. 1977
Hexachlorobenzene	Rat	Gavage	Water	30 Days	Adult	Reproduction	Subchronic							–	1000	Altered Estrus	Percentage of test group affected not known.		Alvarez et al. 2000
Hexachlorobenzene	Mouse	Oral	Food	120 Weekd	Adult	Survival	Chronic							12	24	Decreased Survival	Percentage of test group affected not known.		Cabral et al. 1979
Hexachlorobenzene	Mouse	Gavage	Oil	Gestational Days 8 - 12	Neonate	Developmental	Acute-Developmental							–	125	Maternal and Fetal Toxicity	Percentage of test group affected not known.		Kavlock et al. 1987
Hexachlorobenzene	Rat	Oral	Food	2 Generations	Adult	Reproduction	Chronic							2	–	No Effects Noted	NOAEL Only		Arnold et al. 1985
Hexachlorobenzene	Rat	Oral	Food	2 Generations	Offspring	Developmental	Chronic							–	2	Decreased Neonate Survival	Percentage of test group affected not known.		Arnold et al. 1985
Hexachlorobenzene	Rat	Oral	Food	4 Generations	Offspring	Developmental	Chronic							2	8	Decrease Pup Viability	Percentage of test group affected not known.		Grant et al. 1977
Hexachlorobenzene	Japanese Quail	Oral	Food	90 Days	Juvenile	Reproduction	Chronic	ppm						0.536	2.25	Decrease in hatchability	Percentage of test group affected not known.		Vos et al. 1971
Hexachlorobutadiene	Rat	Oral	Food	43 days (Gestational Days 1-22 + Days 1-21)	Neonate	Developmental	Subchronic - Developmental							2	20	Decreased Body Weight in Neonates	Percentage of test group affected not known.		Schwetz et al. 1977
Hexachlorobutadiene	Rat	Oral	Food	6 Weeks	Neonate	Developmental	Subchronic - Developmental							–	15	Decreased Pup Weight	Percentage of test group affected not known.		Harleman & Seinen 1979
Hexachlorobutadiene	Rat	Oral	Food	10 to 18 Weeks	Adult	Reproduction	Chronic							–	150	Infertility	Percentage of test group affected not known.		Harleman & Seinen 1979
Hexachlorobutadiene	Mouse	Oral	Food	13 Weeks	Adult	Reproduction	Chronic							19.2	–	No Effects Noted	NOAEL Only		NTP 1991; Yang et al. 1989
Hexachlorobutadiene	Rat	Oral	Food	90 Days Plus Gestation and Lactation	Adult	Reproduction	Chronic							20	–	No Effects Noted	NOAEL Only		Kociba et al. 1977b
Hexachlorobutadiene	Rat	Oral	Food	90 Days Plus Gestation and Lactation	Neonate	Developmental	Chronic							2	20	Developmental Effects	Percentage of test group affected not known.		Kociba et al. 1977b
Hexachlorobutadiene	Rat	Oral	Food	2 Years	Adult	Survival	Chronic							2	20	Increased Mortality	Percentage of test group affected not known.		Kociba et al. 1977a
Hexachlorobutadiene	Mouse	Oral	Food	13 Weeks	Adult	Reproduction	Chronic							19.2	–	No Effects Noted	NOAEL Only		NTP 1991; Yang et al. 1989
Hexachlorobutadiene	Japanese Quail	Oral	Food	90 Days	Juvenile	Growth/Reproduction/Reproduction	Chronic							30	–	No Effects Noted	NOAEL only		Schwetz et al. 1974
Hexachlorocyclohexane, alpha (alpha-BHC)	Rat	Oral	Food	23.5 Months	Adult	Growth	Chronic				NA	NA	NA	–	20	Decrese in Body Weight	Percentage of test group affected not known.		Schulte-Hermann R. and W. Parzefall 1981
Hexachlorocyclohexane, alpha (alpha-BHC)	Mouse	Oral	Food	50 Weeks	Adult	Systemic	Chronic	ppm	–	500	0.025	3.8	Nagy 1987	–	76	Liver Nodules	EC100- all test group mice had liver lesions.		Tryphonas and Iverson 1983
Hexachlorocyclohexane, alpha (alpha-BHC)	Mouse	Oral	Food	24 Weeks	Adult	Systemic	Chronic	ppm	50	100	0.029	4.1	Nagy 1987	7	14	Centralob Hypertroph	Percentage of test group affected not known.		Ito et al. 1973
Hexachlorocyclohexane, alpha (alpha-BHC)	Mouse	Oral	Food	24 Weeks	Adult	Growth	Chronic	ppm	250	–	0.029	4.1	Nagy 1987	36	–	No Effects Noted	NOAEL Only		Ito et al. 1973
Hexachlorocyclopentadiene	Rat	Gavage	Oil	13 Weeks	Adult	Survival	Chronic							54	107	Decrease in Survival	100% mortality at LOAEL level.	Dose adjusted based on 5 doses per week	Abdo et al. 1984
Hexachlorocyclopentadiene	Mouse	Gavage	Oil	13 Weeks	Adult	Survival	Chronic							107	214	Decrease in Survival	Percentage of test group affected not known.	Dose adjusted based on 5 doses per week	Abdo et al. 1984
Hexachloroethane	Rat	Gavage	Oil	Gestation Days 6-16	Adult	Reproduction	Acute/Reproduction				NA	NA	NA	100	500	Change in Maternal Toxicity Level	Percentage of test group affected not known.		Weeks et al. 1979
Hexachloroethane	Rat	Gavage	Oil	Gestation Days 6-16	Neonate	Developmental	Acute/Developmental				NA	NA	NA	100	500	Increase Fetal Resporption	Percentage of test group affected not known.		Weeks et al. 1979
Hexachloroethane	Rat	Gavage	Oil	2 Years	Adult	Growth	Chronic				NA	NA	NA	7	14	Decrease Body Weight	10% decrease in male rat body weight.		NTP 1989a
Hexachloroethane	Rat	Oral	Food	16 Weeks	Adult	Systemic	Chronic				NA	NA	NA	15	62	Gross Pathology and Kidney Changed	10/10 males; 6/10 females. EC60-EC100		Gorzinski et al. 1985
Hexachloroethane	Rat	Gavage	Oil	~66 Weeks - 5 Days/Week	Adult	Mortality	Chronic				NA	NA	NA	–	151	Increased Mortality	EC30 test group vs control males.	Dose adjusted based on 5 doses per week	NTP 1978a
Hexachloroethane	Rat	Gavage	Oil	2 Years	Adult	Mortality	Chronic				NA	NA	NA	14	–	No Effects Noted	NOAEL only	Dose adjusted based on 5 doses per week	NTP 1989a
Hexachloroethane	Rat	Gavage	Oil	Gestation Days 7-17	Adult	Reproduction	Acute/Reproduction				NA	NA	NA	167	500	Increased Fetal Resportion	Percentage of test group affected not known.		Shimizu et al. 1992
Hexachloroethane	Rat	Gavage	Oil	Gestation Days 7-17	Neonate	Developmental	Acute/Developmental				NA	NA	NA	167	500	Decreased Fetal Body Weight and Increases Skeletal Abnormalities	Percentage of test group affected not known.		Shimizu et al. 1992
1,3-Isobenzofurandione	Rat	Oral	Food	105 Weeks	Adult	Mortality	Chronic	ppm	15000	–	0.29975	15.5	Nagy 1987	775	–	No Effects Noted	NOAEL only		HEW 1979
1,3-Isobenzofurandione	Mouse	Oral	Food	105 Weeks	Adult	Mortality	Chronic	ppm	28000	–	0.033	4.5	Nagy 1987	3786	–	No Effects Noted	NOAEL only		HEW 1979
1,3-Isobenzofurandione	Mouse	Oral	Food	105 Weeks	Adult	Growth	Chronic	ppm	–	14000	0.033	4.5	Nagy 1987	–	1893	Decreased Growth	Percentage of test group affected not known.		HEW 1979
Isophorone	Rat	Gavage	Oil	103 Weeks - 5Days/Week	Adult	Mortality	Chronic				NA	NA	NA	179	357	Increased Mortality	EC40 at the LOAEL in the test group vs controls		NTP 1986b
Isophorone	Dog	Oral	Capsule	90 Days - 7Days/Week	Adult	Systemic	Chronic				NA	NA	NA	150	–	No Effects Noted	NOAEL only		Nor-Am Agricultural Products 1972
Isopropylbenzene (Cumene)	Rat - Female	Gavage	Oil	194 Days (139 Doses)	Adult	Systemic	Chronic				NA	NA	NA	331	551	Increase in Kidney Weight	Percentage of test group affected not known.		Wolf et al. 1956
MCPA	Rat	Unknown	Unknown	2 Generations	Adult-neonate	Reproduction/ Developmental	Chronic				NA	NA	NA	7.5	22.5	Decreased Pup Weight	Percentage of test group affected not known.		ITFMCPA 1986
Methyl Methacrylate	Rat	Oral	Water	104 Weeks	Adult	Mortality	Chronic		2000 mg/L	–	NA	NA	NA	237 (F); 183(M)	–	No Effects Noted	NOAEL only		Borzelleca et al. 1964
1-Methylnaphthalene	Mouse	Oral	Food	81 Weeks	Adult	Histopathology and Growth	Chronic	% of diet			NA	NA	NA	140 (Calculated in IRIS)	–	No Effects Noted	NOAEL Only		Murata et al. 1997
2-Methylnaphthalene	Mouse	Oral	Food	81 Weeks	Adult	Systemic	Chronic				NA	NA	NA	–	52.3	Alveolar Proteinosis	EC40 - EC55 male and female, respectively		Murata et al. 1997
2-Methylnaphthalene	Mouse	Oral	Food	81 Weeks	Adult	Growth	Chronic				NA	NA	NA	52.3	110.7	7.5% Decrease In Body Weight When Compared With Controls	Percentage of test group affected not known.		Murata et al. 1997
2-Methylnaphthalene	Mouse	Oral	Food	81 Weeks	Adult	Survival	Chronic				NA	NA	NA	110.7	–	No Effects Noted	NOAEL only		Murata et al. 1997
2-Methylphenol (o-cresol)	Rat	Gavage	Unknown	90 Days	Adult	Systemic	Chronic				NA	NA	NA	50	175	Systemic Effects	Percentage of test group affected not known.		EPA 1986b
4-Methylphenol (p-cresol)	Rat	Gavage	Unknown	90 Days	Adult	Systemic	Chronic				NA	NA	NA	50	175	Systemic Effects	Percentage of test group affected not known.		EPA 1987

257

Attachment 2
Toxicity Data Used To Derive NOAEL and Threshold Toxicity Reference Values

Analyte	Test Species	Route of Exposure	Vehicle of Administration	Duration of Exposure	Life Stage Test Species	Endpoint	Duration	Units presented in paper (mg/kg-day unless otherwise noted)	Study NOAEL (mg/kg) If Units Must Be Converted	Study LOAEL (mg/kg) If Units Must Be Converted	Body Weight Test Species (kg)	Ingestion Rate Test Species (g/day)	Body Weight and Ingestion Rate Reference	NOAEL (mg/kgday)	LOAEL (mg/kgday)	Effects	LOAEL ECx	Notes	Reference citation
Methyl Tert-Butyl Ether	Rat	Gavage	Oil	104 Weeks	Adult	Reproduction	Chronic							1000	--	. No Effects Noted	NOAEL Only	Dose adjusted based on 5 doses per week	Belpoggi et al. 1995
Methyl Tert-Butyl Ether	Rat	Gavage	Oil	90 Days	Adult	Reproduction	Chronic							1200	--	No Effects Noted	NOAEL Only		Robinson et al. 1990
2-Nitroaniline	Rat	Gavage	Oil	Gestation Days 6-15	Adult	Reproduction	Acture - Developmental and Reproduction				NA	NA	NA	100	300	Overt Maternal Toxicity	Percentage of test group affected not known.		Monsanto 1985
2-Nitroaniline	Rat	Gavage	Oil	Gestation Days 6-15	Adult	Developmental	Acture - Developmental and Reproduction				NA	NA	NA	600	--	No Effects Noted	NOAEL only		Monsanto 1985
4-Nitroaniline	Rat	Gavage	Oil	2 Years	Adult	Systemic	Chronic				NA	NA	NA	1.5	9	Increase in Liver Weight	Percentage of test group affected not known.		Nair et al. 1990
4-Nitroaniline	Mouse	Gavage	Oil	2 Years	Adult	Survival, Growth	Chronic				NA	NA	NA	71	--	No Effects Noted	NOAEL only	Dose adjusted based on 5 doses per week	NTP 1993
4-Nitroaniline	Rat	Gavage	Unknown	Gestation Days 6-19	Adult/Neonate	Developmental	Acute - Developmental and Reproduction				NA	NA	NA	25	85	Decrease in Fetal Body Weight	Percentage of test group affected not known.		Monsanto 1980
4-Nitroaniline	Rat	Gavage	Unknown	Gestation Days 6-19	Adult/Neonate	Reproduction/ Developmental	Acute - Developmental and Reproduction				NA	NA	NA	85	250	Skeletal/Visceral Anomomalies	Percentage of test group affected not known.		Monsanto 1980
4-Nitroaniline	Rat	Gavage	Oil	2 Generations	Adult/Neonate	Reproduction/ Developmental	Acute - Developmental and Reproduction				NA	NA	NA	9	--	No Effects Noted	NOAEL only		Nair et al. 1990
4-Nitrophenol	Rat	Gavage	Water	13 Weeks - 7 Days/Week	Adult	Systemic	Chronic				NA	NA	NA	140	--	No Effects Noted	NOAEL only		Hazelton 1989
4-Nitrophenol	Rat	Gavage	Water	13 Weeks - 7 Days/Week	Adult	Mortality	Chronic				NA	NA	NA	25	70	Increased Mortality	Apparent EC23 - but no control data in ATSDR toxicity profile. Actualy number is unknown.		Hazelton 1989
4-Nitrophenol	Mouse	Gavage	Oil	Gestation Day 7-14	Adult	Reproduction	Acute/Reproduction				NA	NA	NA	--	400	Decreased Weight Gain and Increased Mortality.	EC19 (control Mortality = 0)		Plasterer et al. 1985
4-Nitrophenol	Mouse	Gavage	Oil	Gestation Day 7-14	Neonate	Developmental	Acute/Developmental				NA	NA	NA	400	--	Decreased Reproductive Index	NOAEL only		Plasterer et al. 1985
n-Nitrosodiphenylamine	Rat	Oral	Food	100 Weeks - 7 Days/Week	Adult	Mortality	Chronic	ppm	1000	4000	0.23	13.3	Nagy 1987	58	232	Increased Mortality	EC18 at the LOAEL vs controls (28% Mortality at the LOAEL vs 10% in the control)		NCI 1979a
n-Nitrosodiphenylamine	Mouse	Oral	Food	98-101 Weeks - 7 Days/Week	Adult	Growth	Chronic	ppm	--	2315	0.029	4.1	Nagy 1987	--	331	Decrease in Body Weight	NOAEL Only		NCI 1979a
n-Nitrosodiphenylamine	Mouse	Oral	Food	98-101 Weeks - 7 Days/Week	Adult	Mortality	Chronic	ppm	2315	--	0.029	4.1	Nagy 1987	331	--	No Effects Noted	NOAEL only		NCI 1979a
n-Nitrosodipropylamine	Rat	Oral	Water	30 Weeks -5 Days/Week	Adult	Mortality	Chronic			90 mg/L	NA	NA	NA	--	4.8	Decreased Longevity	Control data not available. EC100 (100% Mortality) by week 60.		Lijinsky and Taylor 1979
n-Nitrosodipropylamine	Rat	Unknown	Unknown	30 Weeks -2 Days/Week	Adult	Mortality	Chronic				NA	NA	NA	--	6.3	Decreased Longevity	Percentage of test group affected not known.		Lijinsky and Reuber 1983
p-Nitrotoluene	Rat	Oral	Food	104-105 Weeks	Adult	Reproduction	Chronic				NA	NA	NA	60	125	Edometrial Hyperplasia	Percentage of test group affected not known.		NTP 2001
p-Nitrotoluene	Rat	Oral	Food	104-105 Weeks	Adult	Reproduction	Chronic				NA	NA	NA	110	240	Atrophy of the Germinal Epithelium of the Testes	Percentage of test group affected not known.		NTP 2001
p-Nitrotoluene	Rat	Oral	Food	104-105 Weeks	Adult	Mortality	Chronic				NA	NA	NA	252.5	--	No Effects Noted	NOAEL only		NTP 2001
p-Nitrotoluene	Mouse	Oral	Food	105-106 Weeks	Adult	Mortality	Chronic				NA	NA	NA	675	--	No Effects Noted	NOAEL only		NTP 2001
Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine (HMX)	Rat	Oral	Food	13 Weeks	Adult	Growth	Chronic				NA	NA	NA	270	620	Decreased Body Weight	Percentage of test group affected not known.		DOD 1985
Pendimethalin	Rat	Unknown	Unknown	3 Generations	Neonate	Developmental	Chronic							25	250	Reduced Litter Size and Pup Weight	Percentage of test group affected not known.		American Cyanamid 1974
Pentachlorobenzene	Rat	Oral	Food	180 day (F); 100 day (M)	Neonate	Developmental	Chronic				NA	NA	NA	8.5	18	Liver Effects in Neonates	Percentage of test group affected not known.		Linder et al. 1980
Pentachloronitrobenzene	Dog	Oral	Food	2 Years	Adult	Systemic	chronic				NA	NA	NA	0.75	4.5	Liver Effects	Percentage of test group affected not known.		Olin Mathieson Chemical Corporation 1968a
Pentachloronitrobenzene	Rat	Oral	Unknown	3 Generations	Adult	Developmental	Chronic				NA	NA	NA	25	--	No Effects Noted	NOAEL only		Olin Mathieson Chemical Corporation 1968b
Pentachloronitrobenzene	Rat	Oral	Unknown	Gestational Days 6 - 15	Neonate	Developmental	Acute-Developmental							200	--	No Effects Noted	NOAEL Only		Khera and Villenueuve 1975
Pentachloronitrobenzene	Pheasant	Oral	Unknown	30 Days	Adult	Mortality	Subchronic				NA	NA	NA	--	4	Mimimum lethal level.	LOAEL Only		USFWS 1984
Pentachloronitrobenzene	Japanese Quail	Oral	Unknown	30 Days	Adult	Mortality	Subchronic				NA	NA	NA	--	6	Mimimum lethal level.	LOAEL Only		USFWS 1984
Phenol	Rat	Gavage	not specified	Gestation Days 6-15	Neonate	Developmental	Acute/Developmental				NA	NA	NA	120	360	Delayed Ossification	Percentage of test group affected not known.		Argus Lab 1997
Phenol	Rat	Gavage	Water	Gestation Days 6-19	Neonate	Developmental	Acute/Developmental				NA	NA	NA	40	53.3	Decrease in the Number of Live Births	Percentage of test group affected not known.		Narotsky and Kavlock 1995
Phenol	Mouse	Gavage	Water	Gestation Days 6-15	Neonate	Developmental	Acute/Developmental				NA	NA	NA	140	280	Decreased Fetal Body Weight and Increase in the Incidence of Cleft Palletes	Percentage of test group affected not known.		Jones-Price et al. 1983
Pyrene	Mouse	Gavage	Oil	13 Weeks	Adult	Mortality/Systemic	Chronic				NA	NA	NA	250	--	No Effects Noted	NOAEL only		EPA 1989c
Silver	Rat	Oral	Water	37 Weeks	Adult	Growth	Chronic				NA	NA	NA	--	222	Decreased Body Weight	Percentage of test group affected not known.		Matuk et al. 1981
Silver	Rat	Oral	Water	125 Days	Adult	Systemic	Chronic				NA	NA	NA	--	18.1	Systemic Effects	Percentage of test group affected not known.		Rungby et al. 1987
Styrene	Rat	Gavage	Water	10 Days	Neonate	Developmental	Acute-Developmental							300	--	No Effects Noted	NOAEL Only		Murray et al. 1978
Styrene	Rat	Gavage	Oil	60 Days	Adult	Reproduction	Subchronic							200	400	Tubular Degenerations and Decreased Spermatogenesis	Percentage of test group affected not known.		Srivastava et al. 1989
Sulfotep	Rat Wistar Male	Oral	Food	3 Months	Adult	Systemic	Chronic		50	--	0.2615	14	Nagy 1987	2.74	--	No Effects Noted	NOAEL only		Kimmerle and Klimmer 1974
Sulfotep	Rat Wistar Male	Oral	Food	3 Months	Adult	Systemic	Chronic		50	--	0.185	12	Nagy 1987	3.19	--	No Effects Noted	NOAEL only		Kimmerle and Klimmer 1974
1,2,4,5-Tetrachlorobenzene	Rat	Oral	Food	90 Days	Adult	Systemic	Chronic							3.4	34	Severe Kidney Lesions	Percentage of test group affects is not known.		Chu et al. 1984
1,1,2,2-Tetrachloroethane	Rat	Gavage	Oil	103 Weeks	Adult	Mortality	Chronic							89.3	179	Increase in Mortality	Percentage of test group not known	Dose adjusted based on 5 doses per week	NTP 1983b
1,1,2,2-Tetrachloroethane	Rat	Gavage	Oil	78 Weeks	Adult	Reproduction	Chronic							108	--	No Effects Noted	NOAEL Only		NCI 1978d
1,1,2,2-Tetrachloroethane	Mouse	Gavage	Oil	78 Weeks	Adult	Reproduction	Chronic							284	--	No Effects Noted	NOAEL Only		NCI 1978d
1,1,2,2-Tetrachloroethane	Mouse	Gavage	Oil	78 Weeks	Adult	Survival	Chronic							--	284	Increase in Mortality	33/50 males died.		NCI 1978d
2,3,4,6-Tetrachlorophenol	Rat	Gavage	Oil	90 Days	Adult	Growth	Chronic				NA	NA	NA	100	200	Decreased Body Weight	Percentage of test group affected not known.		EPA 1986c
2,3,4,6-Tetrachlorophenol	Rat	Gavage	Oil	Gestation Days 6-15	Adult	Reproduction	Acute - Developmental and Reproduction				NA	NA	NA	100	200	Decreased Body Weight	Percentage of test group affected not known.		Research Triangle Institute 1986
2,3,4,6-Tetrachlorophenol	Rat	Gavage	Oil	Gestation Days 6-15	Adult	Developmental	Acute - Developmental and Reproduction				NA	NA	NA	200	--	No Effects Noted	NOAEL only		Research Triangle Institute 1986
1,2,4-Trichlorobenzene	Rat	Oral	Water	2 Generations	Adult	Mortality	Chronic				NA	NA	NA	53.6(F); 33(M)	--	No Effects Noted	NOAEL only		Robinson et al. 1981
1,2,4-Trichlorobenzene	Rat	Oral	Water	2 Generations	2 Generations	Developmental	Chronic				NA	NA	NA	14.8(F); 8.9(M)	53.6(F); 33(M)	Increase in Adrenal Weight in Neonates	Percentage of test group affected not known.		Robinson et al. 1981
1,1,2-Trichloroethane	Mouse	Gavage	Oil	Gestational Days 8 to 15	Fetus and Neonate	Survival	Acute - Mortality							350	--	No Effects Noted	NOAEL Only		Seidenberg et al. 1986
Trichlorofluoromethane	Rat/Mouse	Gavage	Oil	78 Weeks	Adult	Survival/Systemic	Chronic							--	349	Increase in Mortality	Percentage of test group affected not known.		NCI 1978e
2,4,5-Trichlorophenol	Rat	Unknown	Unknown	98 Days	Adult	Systemic	Chronic							100	300	Changes to Liver and Kidney Functions	Percentage of test group not known	LOAEL based on mild liver/kidney function changes.	McCollister et al. 1961
2,4,6-Trichlorophenol	Rat	Gavage	Oil	11 Weeks	Adult	Reproduction	Subchronic							1000	--	No Effects Noted	NOAEL Only		Blackburn et al. 1986
2,4,6-Trichlorophenol	Rat	Oral	Water	13 Weeks	Adult-Fetus	Reproduction	Chronic							3	30	Decreased litter size	Percentage of test group affected not known		Exon and Koller 1985
2,4,6-Trichlorophenol	Rat	Oral	Oil	Gestational Days 1 - 21	Fetus	Developmental	Subchronic - Developmental							100	500	Decreased Litter Weight	Percentage of test group affected not known		Blackburn et al. 1986
2,4,5-Trichlorophenoxyacetic Acid	Rat	Oral	Food	2 Years	Adult	Growth	Chronic				NA	NA	NA	10	30	Decreased Body Weight	Percentage of test group affected not known.		Kociba et al. 1979
2,4,5-Trichlorophenoxyacetic Acid	Rat	Oral	Food	90 Days + 3 Generations	Adult/ Neonate	Mortality and Reproduction	Chronic				NA	NA	NA	3	10	Increase in Mortality	<EC05 (~91% survival at the LOAEL vs 97% in the control)		Smith et al. 1981
1,2,3-Trichloropropane	Rat	Gavage	Oil	120 Days - 5 Days/Week	Adult	Mortality	Chronic				NA	NA	NA	125	250	Increased Mortality	per IRIS -EC100 rat (high in mouse at same dose)		NTP 1983a
1,2,3-Trichloropropane	Mouse	Gavage	Oil	120 Days - 5 Days/Week	Adult	Systemic	Chronic				NA	NA	NA	32	63	Liver and Kidney Toxicity Deduced from Changes in Serum Enzymes	Percentage of test group affected not known.		NTP 1983a

258

Attachment 2

Toxicity Data Used To Derive NOAEL and Threshold Toxicity Reference Values

Analyte	Test Species	Route of Exposure	Vehicle of Administration	Duration of Exposure	Life Stage Test Species	Endpoint	Duration	Units presented in paper (mg/kg-day unless otherwise noted)	Study NOAEL (mg/kg) If Units Must Be Converted	Study LOAEL (mg/kg) If Units Must Be Converted	Body Weight Test Species (kg)	Ingestion Rate Test Species (g/day)	Body Weight and Ingestion Rate Reference	NOAEL (mg/kgday)	LOAEL (mg/kgday)	Effects	LOAEL ECx	Notes	Reference citation
1,2,3-Trichloropropane	Rat	Gavage	Oil	120 Days - 5 Days/Week	Adult	Systemic	Chronic				NA	NA	NA	16	32	Liver and Kidney Toxicity Deduced from Changes in Serum Enzymes	Percentage of test group affected not known.		NTP 1983a
Trifluralin	Rat	Unknown	Unknown	2 Generations	Adult	Reproduction	Chronic							100	–	No Effects Noted	NOAEL Only		Elanco 1984
Trifluralin	Rat	Unknown	Unknown	2 Generations	Neonate	Developmental	Chronic							32.5	100	Reduced Litter Size	Percentage of test group affected not known.	Dose adjusted based on 5 doses per week	Hoechst 1984
2,4,6-Trinitrotoluene	Rat	Oral	Food	13 Weeks	Adult	Reproduction	Chronic				NA	NA	NA	5	25	Testicular Degeneration	Percentage of test group affected not known.		DOD 1981
2,4,6-Trinitrotoluene	Rat	Oral	Food	13 Weeks	Adult	Reproduction	Chronic				NA	NA	NA	34.7	160	Testicular Atrophy	Percentage of test group affected not known.		Dilley et al. 1982
2,4,6-Trinitrotoluene	Rat	Gavage	Oil	6 Weeks	Adult	Reproduction	Chronic				NA	NA	NA	–	171	Decreased Testes Weight	Percentage of test group affected not known.		Jiang et al. 1991
Vinyl acetate	Rat	Oral	Water	2 Generations	Adult	Reproduction	Chronic							431	–		NOAEL Only		Hazelton 1987
Vinyl acetate	Rat	Oral	Water	2 Generations	Offspring	Developmental	Chronic							117	431	Decrease in Pup Weight Gain	Percentage of test group affected not known.		Hazelton 1987
Vinyl acetate	Rat	Oral	Water	104 Weeks	Adult	Reproduction	Chronic							235	–	No Effects Noted	NOAEL Only		Hazelton 1988

259

260

Attachment 3
Toxicity Reference Values for ECOIs Derived From a Literature Review

ECOI	NOAEL TRV (mg/kg day)	LOAEL TRV (mg/kg day)	NOAEL Source	NOAEL Endpoint	LOAEL Source	LOAEL Endpoint	Threshold TRV (mg/kg day)	Threshold Rationale
Mammals								
Acenaphthene	700	NA	EPA, 1989a	No effects on mouse survival	NA	NA	NA	No effects at highest dose
Ammonium (as Ammonia)	9658	NA	Minana et al. 1985	No changes in reproduction or development	NA	NA	NA	No effects noted at the highest dose level.
Anthracene	1000	NA	EPA, 1989c	No effects on mouse mortality	NA	NA	NA	No effects were predicted at the highest dose level.
Benzyl alcohol	75	750	Hardin et al. 1987	NOAEL estimated from LOAEL	Hardin et al. 1987	Decreased mouse pup body weight and increased maternal mouse mortality	NA	The NOAEL value was estimated from the LOAEL TRV.
Bromodichloromethane	100	200	Ruddick et al. 1983	No effects on growth or reproduction in rats	Ruddick et al. 1983	Developmental effects in neonate rats	141	Single study with multiple endpoints. The 50 mg/kg dose was selected as a NOAEL for fetal skeletal deformations with 100 mg/kg day as NOAEL. 4 of 8 litters showed an extra rib. 200 mg/kg/day showed decreased growth rate in pregnant females, but no effects on reproduction. Since the selected LOAEL is for a sublethal effect with questionable effects of ecological significance, the threshold TRV was calculated.
Bromoform	50		Ruddick et al. 1983	No effects on growth, development, or reproduction in rats	NA	NA	NA	No effects were noted at the highest dose level.
Bromomethane (methyl bromide)	7.1	35.7	Danse et al. 1984	No effects to stomach lining in rats	Danse et al. 1984	Changes to the forestomach lining of rats	16	Only oral toxicity study available. Endpoints are non-reproductive, growth, or mortality. Endpoints based on changes to the forestomach lining. The ability of the LOAEL endpoint to predict ecologcially relevant effects is questionable.
Butylbenzylphthalate	470	1417	NTP, 1985a	No testicular effects in rats	NTP, 1985a	Testicular effects in rats	816	Effects noted in only the highest dose group. The ability of the endpoint to predict ecologically relevant population effects is questionable.
Carbazole	21.1	228	NA	NOAEL was estimated from the LOAEL value	Tsuda et al. 1982	Increase in mortality in mice	NA	NOAEL was estimated from the LOAEL
Carbon disulfide	100	200	Jones-Price, 1984 (as cited in IRIS)	No reproductive effects	Jones-Price, 1984 (as cited in IRIS)	IRIS states "some adverse effects in fetus"	NA	Not enough information is available to calculate threshold TRV.

Attachment 3
Toxicity Reference Values for ECOIs Derived From a Literature Review

ECOI	NOAEL TRV (mg/kg day)	LOAEL TRV (mg/kg day)	NOAEL Source	NOAEL Endpoint	LOAEL Source	LOAEL Endpoint	Threshold TRV (mg/kg day)	Threshold Rationale
4-Chloroaniline	12.5	25	NCI, 1979b	No effects on growth or mortality in rats	NCI, 1979b	Increased mortality and decreased growth in rats	NA	The primary literature source was not obtained. Study was reviewed in IRIS. IRIS reports LOAEL at 12.5, but the endpoint was for splenic lesions. Growth and mortality endpoints were linked with 25 mg/kg day dose. No effects were noted for growth or mortality at the 12.5 mg/kg day dose. Not enough information regarding number of animals affected was available to calculate a threshold TRV.
Chlorobenzene	43	86	NTP, 1985b	No observed mortality in rats	NTP, 1985b	Increased mortality in rats	61	At 78 weeks, 12.5 percent mortality was noted in male rats versus 5% in controls.
bis(2-Chloroethyl)ether	7.1	14.3	Weisburger et al. 1981	No effect on mortality in rats	Weisburger et al. 1981	Decreased survival in rats	NA	35% of the control animals were dead at 52 weeks versus 96% of the test group at the LOAEL. No threshold TRV was calculated.
bis(2-Chloroisopropyl)ether	35.8	198	Mistumouri et al. 1979	No effect on erythrocytes	Mistumouri et al. 1979	Sublethal erythrocyte destruction	84	The primary literature source was not obtained. The study was presented in IRIS as the only available oral study for the ECOI. NOAEL and LOAEL endpoints are both for sublethal erythrocyte destruction and the ability of that endpoint to predict ecologically relevant population effects is highly questionable.
2-Chloronaphthalene	250	600	EPA, 1989d	No liver effects in mice	EPA, 1989d	Increase in liver growth	NA	The primary literature source for the LOAEL was not reviewed. Not enough information is available to calculate a threshold TRV.
2-Chlorophenol	5	50	Exon and Kohler 1985	Increase in still births and decreased litter size in rats	Exon and Kohler 1985	Increase in still births and decreased litter size in rats	NA	Not enough information is available to calculate threshold TRV.
4,4-DDD	141	NA	NCI, 1978c	Mortality in mice	NA	NA	NA	No LOAEL value available.
4,4-DDE	11	22	NCI, 1978c	No increase in mortality in rats	NCI, 1978c	Increased mortality in rats	NA	LOAEL value represents an EC35 which is outside of the agreed upon effect range.
Dibenzofuran	400	NA	Thomas et al. 1940	No effects on rat growth	NA	NA	NA	Low confidence is placed on the TRVs due to the documentation reviewed and the age of the study. No threshold TRV was calculated.
Dibromochloromethane	100	200	Ruddick et al. 1983	No effects on growth or reproduction in rats	Ruddick et al. 1983	Decrease in maternal body weight gain	NA	No information regarding the number of animals affected was available. No threshold TRV was calculated.
Dicamba	3	10	Velsicol, 1978	No effects on fetal body weight and reproduction	Velsicol, 1978	Slightly reduced fetal body weight and increase in the loss of embryos impanted in the euteran wall	NA	Not enough information is available for the LOAEL value to calculate a threshold TRV.
1,2-Dichlorobenzene (o-)	42.9	85.7	NTP, 1985b	No mortality effects on rats	NTP, 1985b	Increased mortality in male rats	NA	42 of 50 animals died at the LOAEL level versus 19 of 50 at the control. IRIS suggests that experimental error is the cause of dealth, but to remain conservative, no threshold TRV is calculated.
1,4-Dichlorobenzene (-p)	107	214	NTP, 1987	Mortality in rats	NTP, 1987	Mortality in rats	151	32% of treatment animals died at 90 weeks versus 12% of control animals.

262

Attachment 3
Toxicity Reference Values for ECOIs Derived From a Literature Review

ECOI	NOAEL TRV (mg/kg day)	LOAEL TRV (mg/kg day)	NOAEL Source	NOAEL Endpoint	LOAEL Source	LOAEL Endpoint	Threshold TRV (mg/kg day)	Threshold Rationale
3,3-Dichlorobenzidine	4.8	48	NA	Mortality in rats. Mortality was noted in the lowest dose level and NOAEL was estimated from the LOAEL.	Stula et al. 1975	Increase in rat mortality	NA	NOAEL was estimated from the LOAEL
Dichlorodifluoromethane	15	150	Sherman, 1974	No effects on rat body weight	Sherman, 1974	Decrease in rat body weight	47	The percentage of the treatment group that was effected is unknown, however, the ability of the endpoint to predict ecologically relevant population effects is questionable.
1,1-Dichloroethane	27.3	273	NCI, 1977	Mortality in rats	NA	NA	NA	NOAEL was estimated from the LOAEL
cis-1,2-Dichloroethene	32	97	McCauley et al. 1990	No change in rat body weight	McCauley et al. 1990	Decrease in rat body weight (males only)	56	10% decrease in rat body weight.
trans-1,2-Dichloroethene	452	NA	Barnes et al. 1985	No change in body weight	NA	NA	NA	No effects at highest dose
2,4-Dichlorophenol	5	50	Exon and Koler 1985	No reproductive effects in mice	Exon and Koler 1985	Decreased mean litter size in mice	NA	The primary source was not located. The data were presented in ATSDR for chlorophenols. The LOAEL is based on decreased litter size but the level of effect is not clear so no threshold TRV was calculated.
4-(2,4-Dichlorophenoxy) butyric acid	8	25	Rhodia, 1969	No reproductive or mortality effects in dogs	Rhodia, 1969	Increase mortality and potential reproductive effects in dogs	NA	No information regarding the number of animals affected was available. No threshold TRV was calculated.
1,2-Dichloropropane	89	179	NTP, 1986a	Mortality in mice	NTP, 1986a	Mortality in mice	126	52% of treatment animals died at 105 weeks versus 33% of control animals.
1,3-Dichloropropene	5	15	Haut et al. 1996	No effect on growth in rats	Haut et al. 1996	Small decrease in body weight gain	8.7	Small decrease in body weight gain is not likely to predict ecologically relevant effects.
Dimethoate	NA	NA						No studies scored >65, so no TRVs are available.
Dimethylphthalate	3500	5000	Hardin et al. 1987	No change in reproductive rates	Hardin et al. 1987	Increase in maternal mortality	NA	Study was acute during a critical lifestage. No reproductive effects were noted at LOAEL. Acute mortality was noted at LOAEL.
4,6-Dinitro-2-methylphenol	10	20	Den Tonkelaar et al. 1983	No reproductive or mortality effects in rats	Den Tonkelaar et al. 1983	Effects on spermatogenesis and mortality in rats	NA	The primary literature source was not obtained, however, the study was reviewed in ATSDR. The LOAEL is for both reproduction and mortality but levels of effects are not known. No threshold TRV was calculated.
2,4-Dinitrophenol	125	350	Kavlock et al. 1987	No reproductive or maternal/fetal mortality effects in mice	Spencer et al. 1948	Increase in testicular atrophy in mice	209	The primary literature source for the LOAEL was not found but the LOAEL value was reviewed in ATSDR. Since the ability of the LOAEL endpoint to predict ecologically relevant population effects is highly questionable, the threshold was calculated.
2,4-Dinitrotoluene	0.057	0.57	Lee et al. 1985	Atrophy of semen tubules	Lee et al. 1985	Atrophy of semen tubules	NA	NOAEL was estimated from the LOAEL

263

Attachment 3
Toxicity Reference Values for ECOIs Derived From a Literature Review

ECOI	NOAEL TRV (mg/kg day)	LOAEL TRV (mg/kg day)	NOAEL Source	NOAEL Endpoint	LOAEL Source	LOAEL Endpoint	Threshold TRV (mg/kg day)	Threshold Rationale
2,6-Dinitrotoluene	11	35	Lee et al. 1976	No reproductive effects in mice	Lee et al. 1976	Decreased spermatogenesis in rats	20	The original paper was not reviewed, however, the ability of the endpoint to predict ecologically relevant population effects is highly questionable.
Di-n-octyphthalate	1668	7500	Mann et al. 1985	No change in testicular morphology	Heindel et al. 1989	Decrease in seminal vessicle weight	3537	All LOAELs (n=2) are unbounded, but 7500 mg/kg day value is highly conservative and ecologically relevent effects are not expected.
1,4-Dioxane	148	1015	Kociba et al. 1974	No effect on rat mortality	Kociba et al. 1974	Increase in mortality in rats	NA	30 to 35% increase in mortality rate at the lowest bounded LOAEL. No threshold TRV calculated.
Ethyl acetate	900	3600	EPA, 1986a	No effects on body weight or survival in rats	EPA, 1986a	Decrease in survival and body weight in rats	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.
Ethylbenzene	97	291	Wolf et al. 1956	No systemic or tissue level effects in rats	Wolf et al. 1956	Increase in liver and kidney weight	168	The percentage of the treatment group that was effected is unknown, however, the ability of the endpoint to predict ecologically relevant population effects is questionable.
Ethyl ether (diethyl ether)	500	2000	EPA, 1986d	No effect on rat body weight	EPA, 1986d	Decrease in rat body weight	NA	Not enough information was available to calculate the threshold TRV.
Fluoranthene	500	NA	EPA, 1989b	No effect on mouse mortality	NA	NA	NA	No effects noted at the highest dose level.
Fluorene	250	500	EPA, 1989b	No effects	EPA, 1989b	Multiple, non-lethal effects	NA	Not enough information is available to calculate threshold TRV.
Heptachlor epoxide	0.125	0.175	Velsicol, 1973	No effect to pup (dog) mortality	Velsicol, 1973	Increase in pup mortality	NA	Not enough information is available to calculate threshold TRV.
Hexachlorobenzene	2	8	Grant et al. 1977	No effect on rat reproduction	Grant et al. 1977	Decreased pup viability in rats	NA	Both NOAEL and LOAEL values are for reduced offspring survival. Dose rates estimated by ATSDR. No information regarding numbers of individuals affected is available. No threshold TRV was calculated.
Hexachlorobutadiene	2	20	Schwetz et al., 1977	No changes in growth, reproduction, or mortality in rats	Schwetz et al. 1977	Decreased growth and increased mortality in rats	NA	No information regarding the number of animals affected was available. No threshold TRV was calculated.
Hexachlorocyclohexane, alpha (alpha-BHC)	36	NA	Ito et al. 1973	No effects on mouse growth	NA	NA	NA	No effectes noted at the highest dose level.
Hexachlorocyclopentadiene	54	107	Abdo et al. 1984	No effect on mouse survival	Abdo et al. 1984	Increase in mouse mortality	NA	NOAEL and LOAEL for mortality. 100% mortality was noted in males at LOAEL dose so no threshold was calculated.
Hexachloroethane	7	14	NTP, 1989a	No effect on rat body weight	NTP, 1989a	Decrease in rat body weight	9.9	10% decrease in rat body weight.
1,3-Isobenzofurnadione	3786	NA	HEW, 1979	No effect on mouse mortality	NA	NA	NA	No effect at the highest dose level.
Isophorone	179	357	NTP, 1986b	No effect on rat mortality	NTP, 1986b	Increase in rat mortality	NA	40% increase in mortality versus control. No threshold should be calculated.
Isopropylbenzene	331	551	Wolf et al. 1956	No effects on kidney weight in female rats	Wolf et al. 1956	Change in kidney weight in female rats	427	The percentage of the treatment group that was effected is unknown, however, the ability of the endpoint to predict ecologically relevant population effects is questionable.

264

Attachment 3
Toxicity Reference Values for ECOIs Derived From a Literature Review

ECOI	NOAEL TRV (mg/kg day)	LOAEL TRV (mg/kg day)	NOAEL Source	NOAEL Endpoint	LOAEL Source	LOAEL Endpoint	Threshold TRV (mg/kg day)	Threshold Rationale
Methyl methacrylate	237	NA	Borzelleca et al. 1964	No effect on survival or histopathology	NA	NA	NA	No effects predicted at the highest dose level.
1-Methyl naphthalene	140	NA	Murata et al. 1997	No effect on mouse growth or gross histopathology	NA	NA	NA	No growth or mortality effects noted at highest dose levels.
2-Methyl naphthalene	52.3	110.7	Murata et al. 1997	No decrease in body weight	Murata et al. 1997	Decrease in body weight in mice	76	Average of 7.5% decrease in body weight when compared to control
Methyl-tert butyl ether	NA	NA						No studies scored >65, so no TRVs are available.
2-Nitroaniline	100	300	Monsanto 1985	No effects on maternal toxicity	Monsanto 1985	Overt maternal toxicity	NA	Not enough information is available to calculate a threshold TRV.
4-Nitroaniline	71	85	NTP, 1993	No effects on survival and body weight in mice	Monsanto, 1980	Decrease in fetal weight	NA	Unknown level of effect at the LOAEL. No threshold TRV calculated.
4-Nitrophenol	25	70	Hazelton, 1989	No increase in mortality in rats	Hazelton, 1989	Increased mortality in rats	NA	Not enough information is available to calculate a threshold TRV.
n-Nitrosodiphenylamine	58	232	NCI, 1979a	No effect on rat mortality	NCI, 1979a	Increase in rat mortality	116	18% increase in mortality (28% at the LOAEL versus 10% at the control).
n-Nitrosodipropylamine	90	NA	Lijinsky and Taylor, 1979	No effect on rat mortality	NA	NA	NA	No effects were noted at the highest dose level.
p-Nitrotoluene	110	125	NTP, 2001	No effects on rat reproduction	NTP, 2001	Endometrial hyperplasia in female rats	117	The original paper was not reviewed, however, the ability of the endpoint to predict ecologically relevant population effects is highly questionable.
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	270	620	DOD, 1985	No change in body weight gain	DOD, 1985	Decrease in body weight gain through study	409	The original paper was not reviewed, however, the ability of the endpoint to predict ecologically relevant population effects is highly questionable.
Pendimethalin	25	250	American Cyanamid, 1974	No effect on rat pup body weight or survival	American Cyanamid, 1974	Decrease rat pup body weight and survival	NA	Not enough information is available to calculate threshold TRV.
Pentachlorobenzene	8.5	18	Linder et al. 1980	No effects on neonate rat livers	Linder et al. 1980	Some effects on livers in neonatal rats	12.4	Liver effects on neonates did not translate into effects on survival or reproduction. The ability of the endpoint to predict population level effects is questionable.
Pentachloronitrobenzene	200	NA	Khera and Villeneuve, 1975	No effect on rat fetal development	NA	NA	NA	No effects noted at the highest dose level.
Phenol	40	53.3	Narotsky and Kavlock, 1995	No effect on rat reproduction	Narotsky and Kavlock, 1995	Decrease in numbers of live births due to maternal respiratory toxicity	NA	Not enough information is available to calculate threshold TRV.
Pyrene	250	NA	EPA, 1989c	No effect on mouse mortality	NA	NA	NA	No effects noted at the highest dose level.
Styrene	300	400	Murray et al. 1978	No developmental or reproductive effects in rats	Srivastava et al. 1989	Possible reproductive effects due to decrease in spermatogenesis	346	The ability of the endpoint to predict ecologically relevant population effects is questionable.
Sulfotep	3.19	NA	Kimmerle and Klimmer, 1974	No systemic effects on rats	NA	NA	NA	No effects predicted at the highest dose level.

265

Attachment 3
Toxicity Reference Values for ECOIs Derived From a Literature Review

ECOI	NOAEL TRV (mg/kg day)	LOAEL TRV (mg/kg day)	NOAEL Source	NOAEL Endpoint	LOAEL Source	LOAEL Endpoint	Threshold TRV (mg/kg day)	Threshold Rationale
1,2,4,5-Tetrachlorobenzene	3.4	34	Chu et al. 1984	No effects on mouse kidneys	Chu et al. 1984	Severe kidney lesions	NA	NOAEL and LOAEL are based on kidney lesions. No reproductive, developmental, growth or mortality measures were identified and ecologically relevant effects are questionable. However, due to the severity of the kidney lesions, no threshold TRV was calculated.
1,1,2,2-Tetrachloroethane	108	179	NCI, 1978d	No reproductive effects noted in rats	NTP, 1983b	Increase in rat mortality	NA	Not enough information was available to calculate the threshold TRV.
2,3,4,6-Tetrachlorophenol	100	200	Research Triangle Institute, 1986	No effects on growth or reproduction in rats	Research Triangle Institute, 1986	Some effects on rat growth and reproduction	NA	The original paper was not reviewed. Not enough information was available to calculate the threshold TRV.
1,2,4-Trichlorobenzene	33	53.6	Robinson et al. 1981.	No effect on rat mortality	Robinson et al. 1981.	Increase of mortality in male rats	na	Not enough information to calculate threshold TRV.
1,1,2-Trichloroethane	350	NA	Seidenberg et al. 1986	No effects on mouse neonate survival	NA	NA	NA	No effects at highest dose
Trichlorofluoromethane	34.9	349	NA	NOAEL estimated from LOAEL	NCI, 1978c	Increase in mortality in rats	NA	Primary source not obtained. Reviewed in IRIS, literature review score was less than 65, but the paper appeared to be sound as discussed in IRIS. Recommend that the value be used with qualifications. Only a LOAEL TRV was available.
2,4,5-Trichlorophenol	100	300	McCollister 1961	No changes in liver and kidney function in rats	McCollister 1961	Slight changes in liver and kidney function in rats	173	The primary source was not located. IRIS notes that this is the only oral toxicity paper available for this compund. NOAEL is reproductive, developmental, and mortality based. LOAEL is based on endpoints that have limited ability to predict ecologically relevant population effects.
2,4,6-Trichlorophenol	3	30	Exon and Koler 1985	No reproductive effects in mice	Exon and Koler 1985	Decreased mean litter size in mice	NA	The primary source was not located. The data were presented in ATSDR for chlorophenols. The LOAEL is based on decreased litter size but the level of effect is not clear so no threshold TRV was calculated.
2,4,5-Trichlorophenoxy acetic acid	3	10	Smith et al. 1981	No effect on rat development or neonate survivial	Smith et al. 1981	Decrease in rat neonate survival	5.5	91% survival at the LOAEL versus 97% in the control.
1,2,3-Trichloropropane	125	250	NTP, 1983a	No mortality effects on rats	NTP, 1983a	Mortality in rats	NA	100% mortality noted at LOAEL. No threshold TRV calculated.
Trifluralin	32.5	100	Hoechst, 1984	No effect on rat reproduction	Hoechst, 1984	Reproductive effects in rats	NA	Primary source not obtained. Reviewed as critical study in IRIS. Not enough information was available to calculate threshold TRV.
1,2,4-Trimethylbenzene	357	1429	EPA, 2003c - PPRV Toxicity Summary	No mortality effects on rats	EPA, 2003c - PPRV Toxicity Summary	Mortality in rats	NA	100% mortality noted at LOAEL. No threshold TRV calculated.
1,3,5-Trimethylbenzene	143	429	EPA, 2003b - PPRV Toxicity Summary	No effect on body weight in rats	EPA, 2003b - PPRV Toxicity Summary	Decrease in body weight in rats	248	11% decrease in body weight over 90 days.

2bb

Attachment 3
Toxicity Reference Values for ECOIs Derived From a Literature Review

ECOI	NOAEL TRV (mg/kg day)	LOAEL TRV (mg/kg day)	NOAEL Source	NOAEL Endpoint	LOAEL Source	LOAEL Endpoint	Threshold TRV (mg/kg day)	Threshold Rationale
2,4,6-Trinitrotoluene	5	25	DOD 1981	No reproductive effects in rats	DOD 1981	Testicular degeneration in rats	11	The percentage of the treatment group that was effected is unknown, however, the ability of the endpoint to predict ecologically relevant population effects is questionable.
Vinyl acetate	235	431	Hazelton et al. 1988	No reproductive effects in rats	Hazelton et al. 1987	Decrease in rat pup weight gain	NA	Primary source not obtained. Reviewed in ATSDR. It is recommended that the NOAEL TRV be used but not enough information is available to calculate a threshold TRV.
Birds								
Dimethoate	0.4	4	NA	NOAEL estimated from LOAEL	USFWS 1984	Minimum lethal dose in pheasant	NA	Primary source not reviewed.
Hexachlorobutadiene	30	300	NA	NOAEL estimated from LOAEL	Schwetz et al. 1974	No effects on growth, reproduction, or mortality at the highest dose level.	NA	Primary source not reviewed.
Hexachlorobenzene	0.563	2.25	Vos et al. 1971	No effect on Japanese quail mortality	Vos et al. 1971	Signficant decrease in quail hatchability	NA	Primary source not reviewed.

Attachment 4
Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors
Receptor - American Kestrel

		Uptake Factor Models												Estimated Concentrations			Intake						
ECOI	TRV(NOAEL)	Plant Model	B0	B1	BAF	Invertebrate Model	B0	B1	BAF	Small Mammal Model	B0	B1	BAF	Plant	Invertebrate	Small Mammal	Plant	Invertebrate	Small Mammal	Soil	Total	SSL NOAEL	Target HQ
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	NA	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003									NA	NA
Arsenic	5.5	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA	1.13E+03	3.23E+01	1.68E+00	0.00E+00	5.94E-01	1.24E-01	4.73E+00	5.45E+00	1.03E+03	1.0
Barium	20.8	BAF			0.477	BAF			0.16	BAF			0.1121	6.28E+02	2.11E+02	1.48E+02	0.00E+00	3.88E+00	1.09E+01	6.06E+00	2.08E+01	1.32E+03	1.0
Beryllium	NA	BAF			0.01	BAF			1.18	BAF			0.003									NA	NA
Boron	28.8	BAF			4	BAF			1	BAF			0.01	6.70E+02	1.67E+02	1.67E+00	0.00E+00	3.08E+00	1.23E-01	7.70E-01	3.98E+00	1.67E+02	1.0
Cadmium	1.47	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA	2.73E+00	7.14E+01	9.95E-01	0.00E+00	1.31E+00	7.33E-02	6.91E-02	1.46E+00	1.50E+01	1.0
Chromium III	1	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	1.17E+00	4.41E+01	1.55E+00	0.00E+00	8.12E-01	1.14E-01	6.42E-02	9.90E-01	1.40E+01	1.0
Chromium VI	1	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	1.19E+00	4.48E+01	1.57E+00	0.00E+00	8.25E-01	1.15E-01	6.52E-02	1.01E+00	1.42E+01	1.0
Cobalt	7.61	BAF			0.0248	BAF			0.291	BAF			0.1	1.09E+01	1.28E+02	4.40E+01	0.00E+00	2.35E+00	3.24E+00	2.02E+00	7.61E+00	4.40E+02	1.0
Copper	2.3	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA	1.46E+01	2.05E+01	1.61E+01	0.00E+00	3.78E-01	1.19E+00	7.57E-01	2.32E+00	1.64E+02	1.0
Cyanide	NA	BAF			1	BAF			1	BAF			1									NA	NA
Fluoride	7.8	BAF			1	BAF			1	BAF			0.362									NA	NA
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	1.63	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA	3.43E+00	3.19E+01	8.11E+00	0.00E+00	5.88E-01	5.97E-01	4.41E-01	1.63E+00	9.58E+01	1.0
Lithium	NA	BAF			0.025	BAF			0.217	BAF			0.006									NA	NA
Manganese	77.6	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037	2.32E+03	2.37E+02	3.67E+02	0.00E+00	4.36E+00	2.70E+01	4.56E+01	7.70E+01	9.92E+03	1.0
Mercury	0.039	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192	4.71E-01	5.32E-01	3.01E-01	0.00E+00	9.79E-03	2.21E-02	7.20E-03	3.91E-02	1.57E+00	1.0
Molybdenum	3.5	BAF			0.25	BAF			2.09	BAF			0.035	1.92E+01	1.60E+02	2.68E+00	0.00E+00	2.95E+00	1.98E-01	3.53E-01	3.50E+00	7.67E+01	1.0
Nickel	1.38	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA	7.41E-01	6.19E+01	2.59E+00	0.00E+00	1.14E+00	1.91E-01	6.02E-02	1.39E+00	1.31E+01	1.0
Nitrate	NA	BAF			1	BAF			1	BAF			1									NA	NA
PCB	0.09	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79	1.06E-02	5.53E-02	1.22E+00	0.00E+00	1.02E-03	8.96E-02	1.95E-04	9.08E-02	4.23E-02	1.0
Selenium	0.23	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA	5.38E+00	4.45E+00	1.48E+00	0.00E+00	8.18E-02	1.09E-01	3.90E-02	2.29E-01	8.48E+00	1.0
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	NA	BAF			2.5	BAF			0.278	BAF			0.002									NA	NA
TCDD (Dioxin)	0.000014	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA	1.70E-05	4.73E-04	6.81E-05	0.00E+00	8.71E-06	5.01E-06	3.56E-07	1.41E-05	7.75E-05	1.0
Thallium	NA	BAF			0.004	BAF			1	BAF			0.123									NA	NA
Tin	0.73	BAF			0.03	BAF			1	BAF			0.21	5.69E-01	1.90E+01	3.99E+00	0.00E+00	3.49E-01	2.93E-01	8.73E-02	7.30E-01	1.90E+01	1.0
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	16	BAF			0.0085	BAF			0.063	BAF			0.00004	2.37E+01	1.76E+02	1.12E-01	0.00E+00	3.24E+00	8.22E-03	1.28E+01	1.61E+01	2.79E+03	1.0
Vanadium	11.4	BAF			0.0097	BAF			0.088	BAF			0.0131	1.47E+01	1.33E+02	1.98E+01	0.00E+00	2.45E+00	1.46E+00	6.96E+00	1.09E+01	1.51E+03	1.0
Zinc	17.2	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA	6.67E+01	4.04E+02	1.28E+02	0.00E+00	7.43E+00	9.41E+00	5.21E-01	1.74E+01	1.13E+02	1.0
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49									NA	NA
Benzo(b)fluoranther	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranther	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthrace	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03									NA	NA
Indeno(1,2,3-cd)pyr	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94									NA	NA
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA = not available
Exposure factors for calculations

IRf	*0.092*	*kg/kg BW/day*
Psoil	*0.05*	
Pplant	*0*	
Pinvert	*0.2*	
Psm	*0.8*	

267

Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors

Receptor - American Kestrel

		Uptake Factor Models												Estimated Concentrations			Intake						
ECOI	**TRV(Threshold)**	**Plant Model**	**B0**	**B1**	**BAF**	**Invertebrate Model**	**B0**	**B1**	**BAF**	**Small Mammal Model**	**B0**	**B1**	**BAF**	**Plant**	**Invertebrate**	**Small Mammal**	**Plant**	**Invertebrate**	**Small Mammal**	**Soil**	**Total**	**SSL Threshold**	**Target HQ**
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	NA	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003									NA	NA
Arsenic	NA	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA									NA	NA
Barium	29.45	BAF			0.477	BAF			0.16	BAF			0.1121	8.89E+02	2.98E+02	2.09E+02	0.00E+00	5.49E+00	1.54E+01	8.58E+00	2.94E+01	1.86E+03	1.0
Beryllium	NA	BAF			0.01	BAF			1.18	BAF			0.003									NA	NA
Boron	NA	BAF			4	BAF			1	BAF			0.01									NA	NA
Cadmium	NA	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA									NA	NA
Chromium III	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA									NA	NA
Chromium VI	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA									NA	NA
Cobalt	7.7	BAF			0.0248	BAF			0.291	BAF			0.1	1.11E+01	1.31E+02	4.49E+01	0.00E+00	2.41E+00	3.31E+00	2.07E+00	7.78E+00	4.49E+02	1.0
Copper	11	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA	3.81E+01	3.91E+01	2.29E+01	0.00E+00	7.20E-01	1.69E+00	8.69E+00	1.11E+01	1.89E+03	1.0
Cyanide	NA	BAF			1	BAF			1	BAF			1									NA	NA
Fluoride	NA	BAF			1	BAF			1	BAF			0.362									NA	NA
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	NA	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA									NA	NA
Lithium	NA	BAF			0.025	BAF			0.217	BAF			0.006									NA	NA
Manganese	NA	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037									NA	NA
Mercury	NA	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192									NA	NA
Molybdenum	NA	BAF			0.25	BAF			2.09	BAF			0.035									NA	NA
Nickel	8.7	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA	3.13E+00	4.25E+02	6.35E+00	0.00E+00	7.82E+00	4.68E-01	4.13E-01	8.70E+00	8.99E+01	1.0
Nitrate	NA	BAF			1	BAF			1	BAF			1									NA	NA
PCB	NA	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79									NA	NA
Selenium	NA	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA									NA	NA
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	NA	BAF			2.5	BAF			0.278	BAF			0.002									NA	NA
TCDD (Dioxin)	NA	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA									NA	NA
Thallium	NA	BAF			0.004	BAF			1	BAF			0.123									NA	NA
Tin	3.66	BAF			0.03	BAF			1	BAF			0.21	4.03E+00	1.34E+02	2.82E+01	0.00E+00	2.47E+00	2.08E+00	6.18E-01	5.17E+00	1.34E+02	1.4
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	NA	BAF			0.0085	BAF			0.063	BAF			0.00004									NA	NA
Vanadium	NA	BAF			0.0097	BAF			0.088	BAF			0.0131									NA	NA
Zinc	NA	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA									NA	NA
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49									NA	NA
Benzo(b)fluoranther	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranther	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthrace	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03									NA	NA
Indeno(1,2,3-cd)pyr	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94									NA	NA
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA = not available

Exposure factors for calculations

IRf	***0.092***	***kg/kg BW/day***
Psoil	***0.05***	
Pplant	***0***	
Pinvert	***0.2***	
Psm	***0.8***	

268

Attachment 4

Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors

Receptor - Mourning Dove (Invertivore)

ECOI	TRV(NOAEL)	Uptake Factor Models												Estimated Concentrations			Intake						
		Plant Model	B0	B1	BAF	Invertebrate Model	B0	B1	BAF	Small Mammal Model	B0	B1	BAF	Plant	Invertebrate	Small Mammal	Plant	Invertebrate	Small Mammal	Soil	Total	SSL NOAEL	Target HQ
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	NA	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003									NA	NA
Arsenic	5.5	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA	1.81E+02	8.84E+00	4.36E-01	0.00E+00	2.03E+00	0.00E+00	3.51E+00	5.54E+00	1.64E+02	1.0
Barium	20.8	BAF			0.477	BAF			0.16	BAF			0.1121	1.71E+02	5.72E+01	4.01E+01	0.00E+00	1.32E+01	0.00E+00	7.65E+00	2.08E+01	3.57E+02	1.0
Beryllium	NA	BAF			0.01	BAF			1.18	BAF			0.003									NA	NA
Boron	28.8	BAF			4	BAF			1	BAF			0.01	4.58E+02	1.15E+02	1.15E+00	0.00E+00	2.63E+01	0.00E+00	2.45E+00	2.88E+01	1.15E+02	1.0
Cadmium	1.47	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA	5.13E-01	6.27E+00	1.76E-01	0.00E+00	1.44E+00	0.00E+00	1.51E-02	1.46E+00	7.05E-01	1.0
Chromium III	1	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	1.12E-01	4.22E+00	2.77E-01	0.00E+00	9.71E-01	0.00E+00	2.86E-02	1.00E+00	1.34E+00	1.0
Chromium VI	1	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	1.12E-01	4.22E+00	2.77E-01	0.00E+00	9.71E-01	0.00E+00	2.86E-02	1.00E+00	1.34E+00	1.0
Cobalt	7.61	BAF			0.0248	BAF			0.291	BAF			0.1	2.16E+00	2.53E+01	8.70E+00	0.00E+00	5.82E+00	0.00E+00	1.86E+00	7.69E+00	8.70E+01	1.0
Copper	2.3	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA	4.48E+00	9.32E+00	1.05E+01	0.00E+00	2.14E+00	0.00E+00	1.76E-01	2.32E+00	8.25E+00	1.0
Cyanide	NA	BAF			1	BAF			1	BAF			1									NA	NA
Fluoride	7.8	BAF			1	BAF			1	BAF			0.362									NA	NA
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	1.63	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA	1.07E+00	6.00E+00	3.25E+00	0.00E+00	1.38E+00	0.00E+00	2.58E-01	1.64E+00	1.21E+01	1.0
Lithium	NA	BAF			0.025	BAF			0.217	BAF			0.006									NA	NA
Manganese	77.6	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037	6.16E+02	9.58E+01	9.74E+01	0.00E+00	2.20E+01	0.00E+00	5.63E+01	7.83E+01	2.63E+03	1.0
Mercury	0.039	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192	2.46E-03	1.70E-01	1.92E-05	0.00E+00	3.91E-02	0.00E+00	2.14E-06	3.91E-02	1.00E-04	1.0
Molybdenum	3.5	BAF			0.25	BAF			2.09	BAF			0.035	1.74E+00	1.46E+01	2.44E-01	0.00E+00	3.35E+00	0.00E+00	1.49E-01	3.50E+00	6.97E+00	1.0
Nickel	1.38	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA	1.27E-01	5.88E+00	8.65E-01	0.00E+00	1.35E+00	0.00E+00	2.66E-02	1.38E+00	1.24E+00	1.0
Nitrate	NA	BAF			1	BAF			1	BAF			1									NA	NA
PCB	0.09	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79	4.30E-02	3.73E-01	4.95E+00	0.00E+00	8.58E-02	0.00E+00	3.68E-03	8.95E-02	1.72E-01	1.0
Selenium	0.23	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA	5.08E-01	9.28E-01	6.60E-01	0.00E+00	2.13E-01	0.00E+00	2.14E-02	2.35E-01	1.00E+00	1.0
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	NA	BAF			2.5	BAF			0.278	BAF			0.002									NA	NA
TCDD (Dioxin)	0.000014	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA	2.94E-06	5.93E-05	9.86E-06	0.00E+00	1.36E-05	0.00E+00	2.86E-07	1.39E-05	1.34E-05	1.0
Thallium	NA	BAF			0.004	BAF			1	BAF			0.123									NA	NA
Tin	0.73	BAF			0.03	BAF			1	BAF			0.21	8.71E-02	2.90E+00	6.10E-01	0.00E+00	6.68E-01	0.00E+00	6.21E-02	7.30E-01	2.90E+00	1.0
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	16	BAF			0.0085	BAF			0.063	BAF			0.00004	3.79E+00	2.81E+01	1.78E-02	0.00E+00	6.46E+00	0.00E+00	9.54E+00	1.60E+01	4.46E+02	1.0
Vanadium	11.4	BAF			0.0097	BAF			0.088	BAF			0.0131	2.66E+00	2.41E+01	3.59E+00	0.00E+00	5.54E+00	0.00E+00	5.86E+00	1.14E+01	2.74E+02	1.0
Zinc	17.2	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA	3.79E+00	7.41E+01	8.70E+01	0.00E+00	1.70E+01	0.00E+00	1.38E-02	1.71E+01	6.46E-01	1.0
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49									NA	NA
Benzo(b)fluoranther	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranther	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthrace	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03									NA	NA
Indeno(1,2,3-cd)pyr	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94									NA	NA
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA = not available

Exposure factors for calculations

IRf	*0.23*	*kg/kg BW/day*
Psoil	*0.093*	
Pplant	*0*	
Pinvert	*1*	
Psm	*0*	

269

Attachment 4
Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors
Receptor - Mourning Dove (Invertivore)

		Uptake Factor Models												Estimated Concentrations			Intake						
ECOI	**TRV(Threshold)**	**Plant Model**	**B0**	**B1**	**BAF**	**Invertebrate Model**	**B0**	**B1**	**BAF**	**Small Mammal Model**	**B0**	**B1**	**BAF**	**Plant**	**Invertebrate**	**Small Mammal**	**Plant**	**Invertebrate**	**Small Mammal**	**Soil**	**Total**	**SSL Threshold**	**Target HQ**
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	NA	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003									NA	NA
Arsenic	NA	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA									NA	NA
Barium	29.45	BAF			0.477	BAF			0.16	BAF			0.1121	2.41E+02	8.10E+01	5.67E+01	0.00E+00	1.86E+01	0.00E+00	1.08E+01	2.95E+01	5.06E+02	1.0
Beryllium	NA	BAF			0.01	BAF			1.18	BAF			0.003									NA	NA
Boron	NA	BAF			4	BAF			1	BAF			0.01									NA	NA
Cadmium	NA	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA									NA	NA
Chromium III	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA									NA	NA
Chromium VI	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA									NA	NA
Cobalt	7.7	BAF			0.0248	BAF			0.291	BAF			0.1	2.18E+00	2.56E+01	8.81E+00	0.00E+00	5.89E+00	0.00E+00	1.88E+00	7.78E+00	8.81E+01	1.0
Copper	11	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA	1.77E+01	2.34E+01	1.73E+01	0.00E+00	5.37E+00	0.00E+00	5.73E+00	1.11E+01	2.68E+02	1.0
Cyanide	NA	BAF			1	BAF			1	BAF			1									NA	NA
Fluoride	NA	BAF			1	BAF			1	BAF			0.362									NA	NA
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	NA	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA									NA	NA
Lithium	NA	BAF			0.025	BAF			0.217	BAF			0.006									NA	NA
Manganese	NA	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037									NA	NA
Mercury	NA	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192									NA	NA
Molybdenum	NA	BAF			0.25	BAF			2.09	BAF			0.035									NA	NA
Nickel	8.7	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA	5.05E-01	3.71E+01	2.04E+00	0.00E+00	8.53E+00	0.00E+00	1.68E-01	8.70E+00	7.84E+00	1.0
Nitrate	NA	BAF			1	BAF			1	BAF			1									NA	NA
PCB	NA	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79									NA	NA
Selenium	NA	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA									NA	NA
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	NA	BAF			2.5	BAF			0.278	BAF			0.002									NA	NA
TCDD (Dioxin)	NA	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA									NA	NA
Thallium	NA	BAF			0.004	BAF			1	BAF			0.123									NA	NA
Tin	3.66	BAF			0.03	BAF			1	BAF			0.21	4.41E-01	1.47E+01	3.09E+00	0.00E+00	3.38E+00	0.00E+00	3.15E-01	3.70E+00	1.47E+01	1.0
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	NA	BAF			0.0085	BAF			0.063	BAF			0.00004									NA	NA
Vanadium	NA	BAF			0.0097	BAF			0.088	BAF			0.0131									NA	NA
Zinc	NA	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA									NA	NA
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49									NA	NA
Benzo(b)fluoranther	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranther	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthrace	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03									NA	NA
Indeno(1,2,3-cd)pyr	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94									NA	NA
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA = not available
Exposure factors for calculations
IRf *0.23 kg/kg BW/day*
Psoil *0.093*
Pplant *0*
Pinvert *1*
Psm *0*

220

Attachment 4
Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors
Receptor - Mourning Dove (Herbivore)

		Uptake Factor Models												Estimated Concentrations			Intake						
ECOI	**TRV(NOAEL)**	**Plant Model**	**B0**	**B1**	**BAF**	**Invertebrate Model**	**B0**	**B1**	**BAF**	**Small Mammal Model**	**B0**	**B1**	**BAF**	**Plant**	**Invertebrate**	**Small Mammal**	**Plant**	**Invertebrate**	**Small Mammal**	**Soil**	**Total**	**SSL NOAEL**	**Target HQ**
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	NA	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003									NA	NA
Arsenic	5.5	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA	2.21E+01	2.00E+00	9.29E-02	5.07E+00	0.00E+00	0.00E+00	4.28E-01	5.50E+00	2.00E+01	1.0
Barium	20.8	BAF			0.477	BAF			0.16	BAF			0.1121	7.57E+01	2.54E+01	1.78E+01	1.74E+01	0.00E+00	0.00E+00	3.39E+00	2.08E+01	1.59E+02	1.0
Beryllium	NA	BAF			0.01	BAF			1.18	BAF			0.003									NA	NA
Boron	28.8	BAF			4	BAF			1	BAF			0.01	1.21E+02	3.03E+01	3.03E-01	2.79E+01	0.00E+00	0.00E+00	6.48E-01	2.85E+01	3.03E+01	1.0
Cadmium	1.47	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA	3.84E+00	1.17E+02	1.42E+00	8.82E-01	0.00E+00	0.00E+00	6.00E-01	1.48E+00	2.81E+01	1.0
Chromium III	1	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	2.06E+00	7.77E+01	2.34E+00	4.75E-01	0.00E+00	0.00E+00	5.25E-01	1.00E+00	2.46E+01	1.0
Chromium VI	1	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	2.06E+00	7.77E+01	2.34E+00	4.75E-01	0.00E+00	0.00E+00	5.25E-01	1.00E+00	2.46E+01	1.0
Cobalt	7.61	BAF			0.0248	BAF			0.291	BAF			0.1	6.90E+00	8.09E+01	2.78E+01	1.59E+00	0.00E+00	0.00E+00	5.95E+00	7.53E+00	2.78E+02	1.0
Copper	2.3	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA	7.34E+00	1.30E+01	1.25E+01	1.69E+00	0.00E+00	0.00E+00	6.17E-01	2.31E+00	2.89E+01	1.0
Cyanide	NA	BAF			1	BAF			1	BAF			1									NA	NA
Fluoride	7.8	BAF			1	BAF			1	BAF			0.362									NA	NA
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	1.63	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA	2.38E+00	1.89E+01	6.08E+00	5.47E-01	0.00E+00	0.00E+00	1.07E+00	1.61E+00	4.99E+01	1.0
Lithium	NA	BAF			0.025	BAF			0.217	BAF			0.006									NA	NA
Manganese	77.6	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037	2.41E+02	5.06E+01	3.82E+01	5.55E+01	0.00E+00	0.00E+00	2.21E+01	7.76E+01	1.03E+03	1.0
Mercury	0.039	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192	1.53E-01	4.17E-01	3.79E-02	3.51E-02	0.00E+00	0.00E+00	4.22E-03	3.94E-02	1.97E-01	1.0
Molybdenum	3.5	BAF			0.25	BAF			2.09	BAF			0.035	1.11E+01	9.27E+01	1.55E+00	2.55E+00	0.00E+00	0.00E+00	9.49E-01	3.50E+00	4.44E+01	1.0
Nickel	1.38	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA	1.84E+00	2.09E+02	4.56E+00	4.23E-01	0.00E+00	0.00E+00	9.44E-01	1.37E+00	4.41E+01	1.0
Nitrate	NA	BAF			1	BAF			1	BAF			1									NA	NA
PCB	0.09	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79	2.85E-01	4.90E+00	3.28E+01	6.56E-02	0.00E+00	0.00E+00	2.44E-02	9.00E-02	1.14E+00	1.0
Selenium	0.23	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA	8.57E-01	1.31E+00	7.89E-01	1.97E-01	0.00E+00	0.00E+00	3.44E-02	2.32E-01	1.61E+00	1.0
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	NA	BAF			2.5	BAF			0.278	BAF			0.002									NA	NA
TCDD (Dioxin)	0.000014	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA	4.28E-05	1.41E-03	1.87E-04	9.84E-06	0.00E+00	0.00E+00	4.16E-06	1.40E-05	1.94E-04	1.0
Thallium	NA	BAF			0.004	BAF			1	BAF			0.123									NA	NA
Tin	0.73	BAF			0.03	BAF			1	BAF			0.21	7.82E-01	2.61E+01	5.47E+00	1.80E-01	0.00E+00	0.00E+00	5.57E-01	7.37E-01	2.61E+01	1.0
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	16	BAF			0.0085	BAF			0.063	BAF			0.00004	5.83E+00	4.32E+01	2.74E-02	1.34E+00	0.00E+00	0.00E+00	1.47E+01	1.60E+01	6.85E+02	1.0
Vanadium	11.4	BAF			0.0097	BAF			0.088	BAF			0.0131	4.88E+00	4.43E+01	6.59E+00	1.12E+00	0.00E+00	0.00E+00	1.08E+01	1.19E+01	5.03E+02	1.0
Zinc	17.2	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA	6.52E+01	3.98E+02	1.27E+02	1.50E+01	0.00E+00	0.00E+00	2.33E+00	1.73E+01	1.09E+02	1.0
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49									NA	NA
Benzo(b)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03									NA	NA
Indeno(1,2,3-cd)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94									NA	NA
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA = not available
Exposure factors for calculations

IRf	*0.23*	*kg/kg BW/day*
Psoil	*0.093*	
Pplant	*1*	
Pinvert	*0*	
Psm	*0*	

221

Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors

Receptor - Mourning Dove (Herbivore)

		Uptake Factor Models											
ECOI	**TRV(Threshold)**	**Plant Model**	**B0**	**B1**	**BAF**	**Invertebrate Model**	**B0**	**B1**	**BAF**	**Small Mammal Model**	**B0**	**B1**	**BAF**
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093
Antimony	NA	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003
Arsenic	NA	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA
Barium	29.45	BAF			0.477	BAF			0.16	BAF			0.1121
Beryllium	NA	BAF			0.01	BAF			1.18	BAF			0.003
Boron	NA	BAF			4	BAF			1	BAF			0.01
Cadmium	NA	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA
Chromium III	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA
Chromium VI	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA
Cobalt	7.7	BAF			0.0248	BAF			0.291	BAF			0.1
Copper	11	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA
Cyanide	NA	BAF			1	BAF			1	BAF			1
Fluoride	NA	BAF			1	BAF			1	BAF			0.362
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA
Lead	NA	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA
Lithium	NA	BAF			0.025	BAF			0.217	BAF			0.006
Manganese	NA	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037
Mercury	NA	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192
Molybdenum	NA	BAF			0.25	BAF			2.09	BAF			0.035
Nickel	8.7	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA
Nitrate	NA	BAF			1	BAF			1	BAF			1
PCB	NA	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79
Selenium	NA	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81
Strontium	NA	BAF			2.5	BAF			0.278	BAF			0.002
TCDD (Dioxin)	NA	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA
Thallium	NA	BAF			0.004	BAF			1	BAF			0.123
Tin	3.66	BAF			0.03	BAF			1	BAF			0.21
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075
Uranium	NA	BAF			0.0085	BAF			0.063	BAF			0.00004
Vanadium	NA	BAF			0.0097	BAF			0.088	BAF			0.0131
Zinc	NA	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7
Benzo(a)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49
Benzo(b)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55
Benzo(k)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54
Dibenz(a,h)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69
Fluorene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03
Indeno(1,2,3-cd)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54
Napthalene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54

	Estimated Concentrations			Intake						
ECOI	**Plant**	**Invertebrate**	**Small Mammal**	**Plant**	**Invertebrate**	**Small Mammal**	**Soil**	**Total**	**SSL Threshold**	**Target HQ**
Aluminum									NA	NA
Antimony									NA	NA
Arsenic									NA	NA
Barium	1.06E+02	3.56E+01	2.49E+01	2.44E+01	0.00E+00	0.00E+00	4.76E+00	2.92E+01	2.22E+02	1.0
Beryllium									NA	NA
Boron									NA	NA
Cadmium									NA	NA
Chromium III									NA	NA
Chromium VI									NA	NA
Cobalt	6.98E+00	8.19E+01	2.81E+01	1.60E+00	0.00E+00	0.00E+00	6.02E+00	7.62E+00	2.81E+02	1.0
Copper	1.88E+01	2.43E+01	1.77E+01	4.32E+00	0.00E+00	0.00E+00	6.69E+00	1.10E+01	3.13E+02	1.0
Cyanide									NA	NA
Fluoride									NA	NA
Iron									NA	NA
Lead									NA	NA
Lithium									NA	NA
Manganese									NA	NA
Mercury									NA	NA
Molybdenum									NA	NA
Nickel	8.09E+00	1.51E+03	1.15E+01	1.86E+00	0.00E+00	0.00E+00	6.85E+00	8.71E+00	3.20E+02	1.0
Nitrate									NA	NA
PCB									NA	NA
Selenium									NA	NA
Silver									NA	NA
Strontium									NA	NA
TCDD (Dioxin)									NA	NA
Thallium									NA	NA
Tin	3.88E+00	1.29E+02	2.72E+01	8.93E-01	0.00E+00	0.00E+00	2.77E+00	3.66E+00	1.29E+02	1.0
Titanium									NA	NA
Uranium									NA	NA
Vanadium									NA	NA
Zinc									NA	NA
Anthracene									NA	NA
Benzo(a)anthracene									NA	NA
Benzo(a)pyrene									NA	NA
Benzo(b)fluoranthene									NA	NA
Benzo(ghi)perylene									NA	NA
Benzo(k)fluoranthene									NA	NA
Chrysene									NA	NA
Dibenz(a,h)anthracene									NA	NA
Fluoranthene									NA	NA
Fluorene									NA	NA
Indeno(1,2,3-cd)pyrene									NA	NA
Napthalene									NA	NA
Phenanthrene									NA	NA
Pyrene									NA	NA

NA = not available

Exposure factors for calculations

IRf *0.23 kg/kg BW/day*

Psoil *0.093*

Pplant *1*

Pinvert *0*

Psm *0*

272

Attachment 4
Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors
Receptor - Mule Deer

		Uptake Factor Models												Estimated Concentrations			Intake						
ECOI	**TRV(NOAEL)**	**Plant Model**	**B0**	**B1**	**BAF**	**Invertebrate Model**	**B0**	**B1**	**BAF**	**Small Mammal Model**	**B0**	**B1**	**BAF**	**Plant**	**Invertebrate**	**Small Mammal**	**Plant**	**Invertebrate**	**Small Mammal**	**Soil**	**Total**	**SSL NOAEL**	**Target HQ**
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	0.06	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003	1.76E+00	5.76E+01	1.73E-01	3.87E-02	0.00E+00	0.00E+00	2.15E-02	6.03E-02	5.76E+01	1.0
Arsenic	0.32	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA	1.43E+01	1.48E+00	6.76E-02	3.15E-01	0.00E+00	0.00E+00	4.86E-03	3.20E-01	1.30E+01	1.0
Barium	51.8	BAF			0.477	BAF			0.16	BAF			0.1121	2.27E+03	7.63E+02	5.34E+02	5.00E+01	0.00E+00	0.00E+00	1.78E+00	5.18E+01	4.77E+03	1.0
Beryllium	0.532	BAF			0.01	BAF			1.18	BAF			0.003	8.96E+00	1.06E+03	2.69E+00	1.97E-01	0.00E+00	0.00E+00	3.35E-01	5.32E-01	8.96E+02	1.0
Boron	28	BAF			4	BAF			1	BAF			0.01	1.25E+03	3.14E+02	3.14E+00	2.76E+01	0.00E+00	0.00E+00	1.17E-01	2.77E+01	3.14E+02	1.0
Cadmium	0.77	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA	2.26E+01	1.55E+03	8.91E+00	4.97E-01	0.00E+00	0.00E+00	2.70E-01	7.68E-01	7.23E+02	1.0
Chromium III	2737	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	1.03E+05	3.89E+06	6.50E+03	2.28E+03	0.00E+00	0.00E+00	4.61E+02	2.74E+03	1.23E+06	1.0
Chromium VI	3.28	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	1.23E+02	4.62E+03	4.67E+01	2.70E+00	0.00E+00	0.00E+00	5.47E-01	3.25E+00	1.46E+03	1.0
Cobalt	7.34	BAF			0.0248	BAF			0.291	BAF			0.1	1.96E+02	2.30E+03	7.90E+02	4.31E+00	0.00E+00	0.00E+00	2.96E+00	7.27E+00	7.90E+03	1.0
Copper	2.67	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA	5.19E+01	4.81E+01	2.56E+01	1.14E+00	0.00E+00	0.00E+00	1.54E+00	2.68E+00	4.12E+03	1.0
Cyanide	68.7	BAF			1	BAF			1	BAF			1	3.07E+03	3.07E+03	3.07E+03	6.76E+01	0.00E+00	0.00E+00	1.15E+00	6.87E+01	3.07E+03	1.0
Fluoride	31.37	BAF			1	BAF			1	BAF			0.362	1.40E+03	1.40E+03	5.08E+02	3.08E+01	0.00E+00	0.00E+00	5.24E-01	3.14E+01	1.40E+03	1.0
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	4.7	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA	4.59E+01	1.34E+03	6.28E+01	1.01E+00	0.00E+00	0.00E+00	3.66E+00	4.68E+00	9.80E+03	1.0
Lithium	9.4	BAF			0.025	BAF			0.217	BAF			0.006	2.54E+02	2.21E+03	6.10E+01	5.60E+00	0.00E+00	0.00E+00	3.80E+00	9.40E+00	1.02E+04	1.0
Manganese	13.7	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037	5.86E+02	9.26E+01	9.27E+01	1.29E+01	0.00E+00	0.00E+00	9.37E-01	1.38E+01	2.51E+03	1.0
Mercury	0.027	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192	1.11E+00	6.41E-01	1.45E+00	2.44E-02	0.00E+00	0.00E+00	2.83E-03	2.72E-02	7.56E+00	1.0
Molybdenum	0.26	BAF			0.25	BAF			2.09	BAF			0.035	1.11E+01	9.25E+01	1.55E+00	2.43E-01	0.00E+00	0.00E+00	1.66E-02	2.60E-01	4.43E+01	1.0
Nickel	0.133	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA	3.98E+00	5.86E+02	7.38E+00	8.75E-02	0.00E+00	0.00E+00	4.63E-02	1.34E-01	1.24E+02	1.0
Nitrate	507	BAF			1	BAF			1	BAF			1	2.27E+04	2.27E+04	2.27E+04	4.99E+02	0.00E+00	0.00E+00	8.47E+00	5.07E+02	2.27E+04	1.0
PCB	0.36	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79	1.53E+01	1.11E+03	1.76E+03	3.37E-01	0.00E+00	0.00E+00	2.29E-02	3.60E-01	6.13E+01	1.0
Selenium	0.05	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA	2.23E+00	2.48E+00	1.09E+00	4.90E-02	0.00E+00	0.00E+00	1.43E-03	5.05E-02	3.82E+00	1.0
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	263	BAF			2.5	BAF			0.278	BAF			0.002	1.18E+04	1.31E+03	9.40E+00	2.59E+02	0.00E+00	0.00E+00	1.76E+00	2.60E+02	4.70E+03	1.0
TCDD (Dioxin)	0.000001	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA	4.22E-05	1.38E-03	1.85E-04	9.28E-07	0.00E+00	0.00E+00	7.17E-08	1.00E-06	1.92E-04	1.0
Thallium	0.48	BAF			0.004	BAF			1	BAF			0.123	4.16E+00	1.04E+03	1.28E+02	9.14E-02	0.00E+00	0.00E+00	3.89E-01	4.80E-01	1.04E+03	1.0
Tin	0.25	BAF			0.03	BAF			1	BAF			0.21	7.25E+00	2.42E+02	5.08E+01	1.60E-01	0.00E+00	0.00E+00	9.04E-02	2.50E-01	2.42E+02	1.0
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	3.07	BAF			0.0085	BAF			0.063	BAF			0.00004	4.65E+01	3.45E+02	2.19E-01	1.02E+00	0.00E+00	0.00E+00	2.05E+00	3.07E+00	5.47E+03	1.0
Vanadium	0.21	BAF			0.0097	BAF			0.088	BAF			0.0131	3.47E+00	3.15E+01	4.68E+00	7.63E-02	0.00E+00	0.00E+00	1.34E-01	2.10E-01	3.58E+02	1.0
Zinc	9.61	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA	3.93E+02	1.15E+03	1.62E+02	8.65E+00	0.00E+00	0.00E+00	1.04E+00	9.69E+00	2.77E+03	1.0
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	1.31	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49	1.80E+01	7.68E+04	6.86E+04	3.96E-01	0.00E+00	0.00E+00	9.01E-01	1.30E+00	2.41E+03	1.0
Benzo(b)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	25	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03	7.15E+02	7.37E+05	7.02E+05	1.57E+01	0.00E+00	0.00E+00	9.37E+00	2.51E+01	2.51E+04	1.0
Indeno(1,2,3-cd)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	50	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94	1.35E+03	1.58E+06	1.78E+06	2.96E+01	0.00E+00	0.00E+00	2.08E+01	5.04E+01	5.57E+04	1.0
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA = not available
Exposure factors for calculations

IRf	*0.022*	*kg/kg BW/day*
Psoil	*0.017*	
Pplant	*1*	
Pinvert	*0*	
Psm	*0*	

273

Attachment 4
Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors
Receptor - Mule Deer

		Uptake Factor Models												Estimated Concentrations			Intake						
ECOI	TRV(Threshold)	Plant Model	B0	B1	BAF	Invertebrate Model	B0	B1	BAF	Small Mammal Model	B0	B1	BAF	Plant	Invertebrate	Small Mammal	Plant	Invertebrate	Small Mammal	Soil	Total	SSL Threshold	Target HQ
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	0.19	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003	5.35E+00	1.89E+02	5.66E-01	1.18E-01	0.00E+00	0.00E+00	7.05E-02	1.88E-01	1.89E+02	1.0
Arsenic	1.23	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA	5.51E+01	3.82E+00	1.82E-01	1.21E+00	0.00E+00	0.00E+00	1.87E-02	1.23E+00	4.99E+01	1.0
Barium	NA	BAF			0.477	BAF			0.16	BAF			0.1121									NA	NA
Beryllium	0.58	BAF			0.01	BAF			1.18	BAF			0.003	9.85E+00	1.16E+03	2.96E+00	2.17E-01	0.00E+00	0.00E+00	3.68E-01	5.85E-01	9.85E+02	1.0
Boron	NA	BAF			4	BAF			1	BAF			0.01									NA	NA
Cadmium	0.84	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA	2.42E+01	1.71E+03	9.56E+00	5.32E-01	0.00E+00	0.00E+00	3.06E-01	8.38E-01	8.17E+02	1.0
Chromium III	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA									NA	NA
Chromium VI	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA									NA	NA
Cobalt	8.94	BAF			0.0248	BAF			0.291	BAF			0.1	2.39E+02	2.80E+03	9.62E+02	5.25E+00	0.00E+00	0.00E+00	3.60E+00	8.85E+00	9.62E+03	1.0
Copper	NA	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA									NA	NA
Cyanide	NA	BAF			1	BAF			1	BAF			1									NA	NA
Fluoride	NA	BAF			1	BAF			1	BAF			0.362									NA	NA
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	4.85	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA	4.80E+01	1.42E+03	6.50E+01	1.06E+00	0.00E+00	0.00E+00	3.96E+00	5.02E+00	1.06E+04	1.0
Lithium	NA	BAF			0.025	BAF			0.217	BAF			0.006									NA	NA
Manganese	46.69	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037	1.98E+03	2.12E+02	3.13E+02	4.35E+01	0.00E+00	0.00E+00	3.16E+00	4.67E+01	8.46E+03	1.0
Mercury	NA	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192									NA	NA
Molybdenum	NA	BAF			0.25	BAF			2.09	BAF			0.035									NA	NA
Nickel	NA	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA									NA	NA
Nitrate	NA	BAF			1	BAF			1	BAF			1									NA	NA
PCB	0.51	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79	2.15E+01	1.76E+03	2.47E+03	4.73E-01	0.00E+00	0.00E+00	3.21E-02	5.05E-01	8.60E+01	1.0
Selenium	NA	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA									NA	NA
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	NA	BAF			2.5	BAF			0.278	BAF			0.002									NA	NA
TCDD (Dioxin)	NA	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA									NA	NA
Thallium	0.83	BAF			0.004	BAF			1	BAF			0.123	7.19E+00	1.80E+03	2.21E+02	1.58E-01	0.00E+00	0.00E+00	6.72E-01	8.30E-01	1.80E+03	1.0
Tin	NA	BAF			0.03	BAF			1	BAF			0.21									NA	NA
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	NA	BAF			0.0085	BAF			0.063	BAF			0.00004									NA	NA
Vanadium	NA	BAF			0.0097	BAF			0.088	BAF			0.0131									NA	NA
Zinc	NA	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA									NA	NA
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	6.55	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49	5.57E+01	4.55E+05	4.06E+05	1.23E+00	0.00E+00	0.00E+00	5.33E+00	6.56E+00	1.43E+04	1.0
Benzo(b)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03									NA	NA
Indeno(1,2,3-cd)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	86.6	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94	2.19E+03	2.93E+06	3.30E+06	4.82E+01	0.00E+00	0.00E+00	3.86E+01	8.68E+01	1.03E+05	1.0
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA = not available
Exposure factors for calculations

IRf	*0.022*	*kg/kg BW/day*
Psoil	*0.017*	
Pplant	*1*	
Pinvert	*0*	
Psm	*0*	

274

Attachment 4
Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors
Receptor - PMJM

		Uptake Factor Models												Estimated Concentrations			Intake						
ECOI	TRV(NOAEL)	Plant Model	B0	B1	BAF	Invertebrate Model	B0	B1	BAF	Small Mammal Model	B0	B1	BAF	Plant	Invertebrate	Small Mammal	Plant	Invertebrate	Small Mammal	Soil	Total	SSL NOAEL	Target HQ
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	0.06	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003	3.94E-02	1.00E+00	3.00E-03	4.69E-03	5.10E-02	0.00E+00	4.08E-03	5.98E-02	1.00E+00	1.0
Arsenic	0.32	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA	2.43E+00	4.22E-01	1.84E-02	2.90E-01	2.15E-02	0.00E+00	9.00E-03	3.20E-01	2.21E+00	1.0
Barium	51.8	BAF			0.477	BAF			0.16	BAF			0.1121	3.54E+02	1.19E+02	8.33E+01	4.22E+01	6.06E+00	0.00E+00	3.03E+00	5.13E+01	7.43E+02	1.0
Beryllium	0.532	BAF			0.01	BAF			1.18	BAF			0.003	8.16E-02	9.63E+00	2.45E-02	9.71E-03	4.91E-01	0.00E+00	3.33E-02	5.34E-01	8.16E+00	1.0
Boron	28	BAF			4	BAF			1	BAF			0.01	2.11E+02	5.27E+01	5.27E-01	2.51E+01	2.69E+00	0.00E+00	2.15E-01	2.80E+01	5.27E+01	1.0
Cadmium	0.77	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA	8.44E-01	1.29E+01	2.95E-01	1.00E-01	6.60E-01	0.00E+00	7.16E-03	7.68E-01	1.75E+00	1.0
Chromium III	2737	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	1.35E+03	5.08E+04	2.71E+02	1.61E+02	2.59E+03	0.00E+00	6.56E+01	2.82E+03	1.61E+04	1.0
Chromium VI	3.28	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	1.62E+00	6.09E+01	1.96E+00	1.93E-01	3.11E+00	0.00E+00	7.86E-02	3.38E+00	1.93E+01	1.0
Cobalt	7.34	BAF			0.0248	BAF			0.291	BAF			0.1	8.44E+00	9.90E+01	3.40E+01	1.00E+00	5.05E+00	0.00E+00	1.39E+00	7.44E+00	3.40E+02	1.0
Copper	2.67	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA	1.17E+01	1.78E+01	1.49E+01	1.40E+00	9.06E-01	0.00E+00	3.87E-01	2.69E+00	9.50E+01	1.0
Cyanide	68.7	BAF			1	BAF			1	BAF			1	3.81E+02	3.81E+02	3.81E+02	4.54E+01	1.94E+01	0.00E+00	1.56E+00	6.64E+01	3.81E+02	1.0
Fluoride	31.37	BAF			1	BAF			1	BAF			0.362	1.80E+02	1.80E+02	6.52E+01	2.14E+01	9.19E+00	0.00E+00	7.35E-01	3.14E+01	1.80E+02	1.0
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	4.7	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA	5.46E+00	6.25E+01	1.17E+01	6.50E-01	3.19E+00	0.00E+00	8.98E-01	4.74E+00	2.20E+02	1.0
Lithium	9.4	BAF			0.025	BAF			0.217	BAF			0.006	1.30E+01	1.13E+02	3.11E+00	1.54E+00	5.74E+00	0.00E+00	2.12E+00	9.40E+00	5.19E+02	1.0
Manganese	13.7	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037	9.08E+01	2.60E+01	1.44E+01	1.08E+01	1.32E+00	0.00E+00	1.58E+00	1.37E+01	3.88E+02	1.0
Mercury	0.027	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192	7.40E-02	3.56E-01	1.00E-02	8.81E-03	1.82E-02	0.00E+00	2.13E-04	2.72E-02	5.21E-02	1.0
Molybdenum	0.26	BAF			0.25	BAF			2.09	BAF			0.035	4.61E-01	3.85E+00	6.45E-02	5.48E-02	1.96E-01	0.00E+00	7.52E-03	2.59E-01	1.84E+00	1.0
Nickel	0.133	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA	6.54E-02	2.41E+00	5.72E-01	7.78E-03	1.23E-01	0.00E+00	2.08E-03	1.33E-01	5.10E-01	1.0
Nitrate	507	BAF			1	BAF			1	BAF			1	2.91E+03	2.91E+03	2.91E+03	3.47E+02	1.49E+02	0.00E+00	1.19E+01	5.07E+02	2.91E+03	1.0
PCB	0.36	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79	3.37E-01	6.16E+00	3.89E+01	4.02E-02	3.14E-01	0.00E+00	5.51E-03	3.60E-01	1.35E+00	1.0
Selenium	0.05	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA	1.95E-01	4.92E-01	4.76E-01	2.32E-02	2.51E-02	0.00E+00	1.72E-03	5.00E-02	4.21E-01	1.0
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	263	BAF			2.5	BAF			0.278	BAF			0.002	2.08E+03	2.32E+02	1.67E+00	2.48E+02	1.18E+01	0.00E+00	3.40E+00	2.63E+02	8.33E+02	1.0
TCDD (Dioxin)	0.000001	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA	1.01E-06	1.68E-05	3.06E-06	1.21E-07	8.59E-07	0.00E+00	1.88E-08	9.99E-07	4.61E-06	1.0
Thallium	0.48	BAF			0.004	BAF			1	BAF			0.123	3.46E-02	8.64E+00	1.06E+00	4.11E-03	4.41E-01	0.00E+00	3.53E-02	4.80E-01	8.64E+00	1.0
Tin	0.25	BAF			0.03	BAF			1	BAF			0.21	1.27E-01	4.22E+00	8.86E-01	1.51E-02	2.15E-01	0.00E+00	1.72E-02	2.48E-01	4.22E+00	1.0
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	3.07	BAF			0.0085	BAF			0.063	BAF			0.00004	3.14E+00	2.33E+01	1.48E-02	3.74E-01	1.19E+00	0.00E+00	1.51E+00	3.07E+00	3.70E+02	1.0
Vanadium	0.21	BAF			0.0097	BAF			0.088	BAF			0.0131	2.10E-01	1.90E+00	2.83E-01	2.49E-02	9.69E-02	0.00E+00	8.81E-02	2.10E-01	2.16E+01	1.0
Zinc	9.61	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA	1.35E+01	1.57E+02	1.03E+02	1.61E+00	8.02E+00	0.00E+00	2.61E-02	9.66E+00	6.41E+00	1.0
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	1.31	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49	1.11E-01	2.55E+01	2.28E+01	1.33E-02	1.30E+00	0.00E+00	3.26E-03	1.32E+00	8.00E-01	1.0
Benzo(b)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	25	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03	2.17E+00	4.84E+02	4.61E+02	2.58E-01	2.47E+01	0.00E+00	6.71E-02	2.50E+01	1.65E+01	1.0
Indeno(1,2,3-cd)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	50	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94			3.91E+05	0.00E+00	0.00E+00	0.00E+00	5.00E+01	5.00E+01	1.23E+04	1.0
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA = not available

Exposure factors for calculations

IRf	*0.17*	*kg/kg BW/day*
Psoil	*0.024*	
Pplant	*0.7*	
Pinvert	*0.3*	
Psm	*0*	

275

Attachment 4
Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors
Receptor - Coyote (Carnivore)

		Uptake Factor Models												Estimated Concentrations			Intake						
ECOI	**TRV(NOAEL)**	**Plant Model**	**B0**	**B1**	**BAF**	**Invertebrate Model**	**B0**	**B1**	**BAF**	**Small Mammal Model**	**B0**	**B1**	**BAF**	**Plant**	**Invertebrate**	**Small Mammal**	**Plant**	**Invertebrate**	**Small Mammal**	**Soil**	**Total**	**SSL NOAEL**	**Target HQ**
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	0.06	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003	3.75E+00	1.29E+02	3.87E-01	0.00E+00	0.00E+00	5.81E-03	5.42E-02	6.00E-02	1.29E+02	1.0
Arsenic	0.32	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA	7.82E+02	2.48E+01	1.28E+00	0.00E+00	0.00E+00	1.92E-02	2.98E-01	3.17E-01	7.09E+02	1.0
Barium	51.8	BAF			0.477	BAF			0.16	BAF			0.1121	1.19E+04	3.98E+03	2.79E+03	0.00E+00	0.00E+00	4.19E+01	1.05E+01	5.23E+01	2.49E+04	1.0
Beryllium	0.532	BAF			0.01	BAF			1.18	BAF			0.003	1.14E+01	1.35E+03	3.43E+00	0.00E+00	0.00E+00	5.15E-02	4.81E-01	5.32E-01	1.14E+03	1.0
Boron	28	BAF			4	BAF			1	BAF			0.01	1.98E+05	4.96E+04	4.96E+02	0.00E+00	0.00E+00	7.44E+00	2.08E+01	2.83E+01	4.96E+04	1.0
Cadmium	0.77	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA	3.19E+01	2.57E+03	1.28E+01	0.00E+00	0.00E+00	1.91E-01	5.71E-01	7.63E-01	1.36E+03	1.0
Chromium III	2737	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	4.82E+05	1.81E+07	2.01E+04	0.00E+00	0.00E+00	3.01E+02	2.41E+03	2.71E+03	5.74E+06	1.0
Chromium VI	3.28	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	3.50E+02	1.32E+04	1.01E+02	0.00E+00	0.00E+00	1.51E+00	1.75E+00	3.26E+00	4.17E+03	1.0
Cobalt	7.34	BAF			0.0248	BAF			0.291	BAF			0.1	9.39E+01	1.10E+03	3.78E+02	0.00E+00	0.00E+00	5.68E+00	1.59E+00	7.27E+00	3.78E+03	1.0
Copper	2.67	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA	5.79E+01	5.18E+01	2.67E+01	0.00E+00	0.00E+00	4.00E-01	2.29E+00	2.69E+00	5.46E+03	1.0
Cyanide	68.7	BAF			1	BAF			1	BAF			1	4.46E+03	4.46E+03	4.46E+03	0.00E+00	0.00E+00	6.68E+01	1.87E+00	6.87E+01	4.46E+03	1.0
Fluoride	31.37	BAF			1	BAF			1	BAF			0.362	5.42E+03	5.42E+03	1.96E+03	0.00E+00	0.00E+00	2.94E+01	2.27E+00	3.17E+01	5.42E+03	1.0
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	4.7	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA	4.36E+01	1.24E+03	6.03E+01	0.00E+00	0.00E+00	9.04E-01	3.75E+00	4.65E+00	8.93E+03	1.0
Lithium	9.4	BAF			0.025	BAF			0.217	BAF			0.006	4.61E+02	4.00E+03	1.11E+02	0.00E+00	0.00E+00	1.66E+00	7.74E+00	9.40E+00	1.84E+04	1.0
Manganese	13.7	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037	3.29E+03	3.00E+02	5.20E+02	0.00E+00	0.00E+00	7.80E+00	5.90E+00	1.37E+01	1.41E+04	1.0
Mercury	0.027	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192	1.16E+00	6.47E-01	1.57E+00	0.00E+00	0.00E+00	2.36E-02	3.44E-03	2.70E-02	8.18E+00	1.0
Molybdenum	0.26	BAF			0.25	BAF			2.09	BAF			0.035	6.88E+01	5.75E+02	9.63E+00	0.00E+00	0.00E+00	1.44E-01	1.16E-01	2.60E-01	2.75E+02	1.0
Nickel	0.133	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA	3.16E+00	4.30E+02	6.39E+00	0.00E+00	0.00E+00	9.58E-02	3.82E-02	1.34E-01	9.09E+01	1.0
Nitrate	507	BAF			1	BAF			1	BAF			1	3.29E+04	3.29E+04	3.29E+04	0.00E+00	0.00E+00	4.93E+02	1.38E+01	5.07E+02	3.29E+04	1.0
PCB	0.36	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79	2.08E-01	3.19E+00	2.40E+01	0.00E+00	0.00E+00	3.60E-01	3.50E-04	3.60E-01	8.33E-01	1.0
Selenium	0.05	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA	2.37E+01	1.19E+01	2.45E+00	0.00E+00	0.00E+00	3.67E-02	1.36E-02	5.03E-02	3.25E+01	1.0
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	263	BAF			2.5	BAF			0.278	BAF			0.002	1.46E+06	1.62E+05	1.17E+03	0.00E+00	0.00E+00	1.75E+01	2.45E+02	2.63E+02	5.84E+05	1.0
TCDD (Dioxin)	0.000001	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA	1.62E-05	4.45E-04	6.43E-05	0.00E+00	0.00E+00	9.64E-07	3.09E-08	9.95E-07	7.35E-05	1.0
Thallium	0.48	BAF			0.004	BAF			1	BAF			0.123	8.48E-01	2.12E+02	2.61E+01	0.00E+00	0.00E+00	3.91E-01	8.90E-02	4.80E-01	2.12E+02	1.0
Tin	0.25	BAF			0.03	BAF			1	BAF			0.21	2.10E+00	7.00E+01	1.47E+01	0.00E+00	0.00E+00	2.21E-01	2.94E-02	2.50E-01	7.00E+01	1.0
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	3.07	BAF			0.0085	BAF			0.063	BAF			0.00004	6.20E+01	4.60E+02	2.92E-01	0.00E+00	0.00E+00	4.38E-03	3.07E+00	3.07E+00	7.30E+03	1.0
Vanadium	0.21	BAF			0.0097	BAF			0.088	BAF			0.0131	3.30E+00	3.00E+01	4.46E+00	0.00E+00	0.00E+00	6.69E-02	1.43E-01	2.10E-01	3.41E+02	1.0
Zinc	9.61	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA	1.06E+03	2.07E+03	1.85E+02	0.00E+00	0.00E+00	2.78E+00	6.93E+00	9.71E+00	1.65E+04	1.0
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	1.31	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49	2.61E-01	9.77E+01	8.72E+01	0.00E+00	0.00E+00	1.31E+00	1.29E-03	1.31E+00	3.06E+00	1.0
Benzo(b)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	25	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03	5.99E+00	1.75E+03	1.67E+03	0.00E+00	0.00E+00	2.50E+01	2.49E-02	2.50E+01	5.94E+01	1.0
Indeno(1,2,3-cd)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	50	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94	9.35E+00	2.96E+03	3.33E+03	0.00E+00	0.00E+00	5.00E+01	4.38E-02	5.00E+01	1.04E+02	1.0
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA = not available
Exposure factors for calculations

IRf	*0.015*	*kg/kg BW/day*
Psoil	*0.028*	
Pplant	*0*	
Pinvert	*0*	
Psm	*1*	

276

Attachment 4
Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors
Receptor - Coyote (Carnivore)

		Uptake Factor Models												Estimated Concentrations			Intake						
ECOI	**TRV(Threshold)**	**Plant Model**	**B0**	**B1**	**BAF**	**Invertebrate Model**	**B0**	**B1**	**BAF**	**Small Mammal Model**	**B0**	**B1**	**BAF**	**Plant**	**Invertebrate**	**Small Mammal**	**Plant**	**Invertebrate**	**Small Mammal**	**Soil**	**Total**	**SSL Threshold**	**Target HQ**
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	0.19	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003	1.09E+01	4.05E+02	1.21E+00	0.00E+00	0.00E+00	1.82E-02	1.70E-01	1.88E-01	4.05E+02	1.0
Arsenic	1.23	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA	3.23E+03	6.77E+01	3.63E+00	0.00E+00	0.00E+00	5.45E-02	1.23E+00	1.28E+00	2.93E+03	1.0
Barium	NA	BAF			0.477	BAF			0.16	BAF			0.1121									NA	NA
Beryllium	0.58	BAF			0.01	BAF			1.18	BAF			0.003	1.26E+01	1.49E+03	3.78E+00	0.00E+00	0.00E+00	5.67E-02	5.29E-01	5.86E-01	1.26E+03	1.0
Boron	NA	BAF			4	BAF			1	BAF			0.01									NA	NA
Cadmium	0.84	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA	3.37E+01	2.77E+03	1.35E+01	0.00E+00	0.00E+00	2.02E-01	6.30E-01	8.32E-01	1.50E+03	1.0
Chromium III	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA									NA	NA
Chromium VI	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA									NA	NA
Cobalt	8.94	BAF			0.0248	BAF			0.291	BAF			0.1	1.14E+02	1.34E+03	4.61E+02	0.00E+00	0.00E+00	6.91E+00	1.94E+00	8.85E+00	4.61E+03	1.0
Copper	NA	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA									NA	NA
Cyanide	NA	BAF			1	BAF			1	BAF			1									NA	NA
Fluoride	NA	BAF			1	BAF			1	BAF			0.362									NA	NA
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	4.85	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA	4.53E+01	1.31E+03	6.21E+01	0.00E+00	0.00E+00	9.32E-01	4.02E+00	4.95E+00	9.57E+03	1.0
Lithium	NA	BAF			0.025	BAF			0.217	BAF			0.006									NA	NA
Manganese	46.69	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037	1.12E+04	6.93E+02	1.77E+03	0.00E+00	0.00E+00	2.66E+01	2.01E+01	4.67E+01	4.79E+04	1.0
Mercury	NA	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192									NA	NA
Molybdenum	NA	BAF			0.25	BAF			2.09	BAF			0.035									NA	NA
Nickel	NA	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA									NA	NA
Nitrate	NA	BAF			1	BAF			1	BAF			1									NA	NA
PCB	0.51	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79	2.95E-01	5.13E+00	3.40E+01	0.00E+00	0.00E+00	5.10E-01	4.96E-04	5.10E-01	1.18E+00	1.0
Selenium	NA	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA									NA	NA
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	NA	BAF			2.5	BAF			0.278	BAF			0.002									NA	NA
TCDD (Dioxin)	NA	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA									NA	NA
Thallium	0.83	BAF			0.004	BAF			1	BAF			0.123	1.47E+00	3.66E+02	4.51E+01	0.00E+00	0.00E+00	6.76E-01	1.54E-01	8.30E-01	3.66E+02	1.0
Tin	NA	BAF			0.03	BAF			1	BAF			0.21									NA	NA
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	NA	BAF			0.0085	BAF			0.063	BAF			0.00004									NA	NA
Vanadium	NA	BAF			0.0097	BAF			0.088	BAF			0.0131									NA	NA
Zinc	NA	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA									NA	NA
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	6.55	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49	7.31E-01	4.93E+02	4.41E+02	0.00E+00	0.00E+00	6.61E+00	6.50E-03	6.62E+00	1.55E+01	1.0
Benzo(b)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03									NA	NA
Indeno(1,2,3-cd)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	86.6	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94	1.46E+01	5.18E+03	5.83E+03	0.00E+00	0.00E+00	8.74E+01	7.66E-02	8.75E+01	1.82E+02	1.0
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA = not available
Exposure factors for calculations
IRf *0.015 kg/kg BW/day*
Psoil *0.028*
Pplant *0*
Pinvert *0*
Psm *1*

277

Attachment 4
Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors
Receptor - Coyote (Insectivore)

		Uptake Factor Models											
ECOI	**TRV(NOAEL)**	**Plant Model**	**B0**	**B1**	**BAF**	**Invertebrate Model**	**B0**	**B1**	**BAF**	**Small Mammal Model**	**B0**	**B1**	**BAF**
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093
Antimony	0.06	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003
Arsenic	0.32	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA
Barium	51.8	BAF			0.477	BAF			0.16	BAF			0.1121
Beryllium	0.532	BAF			0.01	BAF			1.18	BAF			0.003
Boron	28	BAF			4	BAF			1	BAF			0.01
Cadmium	0.77	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA
Chromium III	2737	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA
Chromium VI	3.28	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA
Cobalt	7.34	BAF			0.0248	BAF			0.291	BAF			0.1
Copper	2.67	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA
Cyanide	68.7	BAF			1	BAF			1	BAF			1
Fluoride	31.37	BAF			1	BAF			1	BAF			0.362
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA
Lead	4.7	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA
Lithium	9.4	BAF			0.025	BAF			0.217	BAF			0.006
Manganese	13.7	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037
Mercury	0.027	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192
Molybdenum	0.26	BAF			0.25	BAF			2.09	BAF			0.035
Nickel	0.133	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA
Nitrate	507	BAF			1	BAF			1	BAF			1
PCB	0.36	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79
Selenium	0.05	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81
Strontium	263	BAF			2.5	BAF			0.278	BAF			0.002
TCDD (Dioxin)	0.000001	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA
Thallium	0.48	BAF			0.004	BAF			1	BAF			0.123
Tin	0.25	BAF			0.03	BAF			1	BAF			0.21
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075
Uranium	3.07	BAF			0.0085	BAF			0.063	BAF			0.00004
Vanadium	0.21	BAF			0.0097	BAF			0.088	BAF			0.0131
Zinc	9.61	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7
Benzo(a)pyrene	1.31	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49
Benzo(b)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55
Benzo(k)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54
Dibenz(a,h)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69
Fluorene	25	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03
Indeno(1,2,3-cd)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54
Napthalene	50	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54

	Estimated Concentrations			Intake						
ECOI	**Plant**	**Invertebrate**	**Small Mammal**	**Plant**	**Invertebrate**	**Small Mammal**	**Soil**	**Total**	**SSL NOAEL**	**Target HQ**
Aluminum									NA	NA
Antimony	1.40E-01	3.85E+00	1.16E-02	0.00E+00	5.78E-02	0.00E+00	1.62E-03	5.94E-02	3.85E+00	1.0
Arsenic	3.23E+02	1.33E+01	6.68E-01	0.00E+00	2.00E-01	0.00E+00	1.23E-01	3.23E-01	2.93E+02	1.0
Barium	8.76E+03	2.94E+03	2.06E+03	0.00E+00	4.41E+01	0.00E+00	7.71E+00	5.18E+01	1.84E+04	1.0
Beryllium	2.92E-01	3.44E+01	8.76E-02	0.00E+00	5.17E-01	0.00E+00	1.23E-02	5.29E-01	2.92E+01	1.0
Boron	7.26E+03	1.82E+03	1.82E+01	0.00E+00	2.72E+01	0.00E+00	7.63E-01	2.80E+01	1.82E+03	1.0
Cadmium	2.15E+00	5.06E+01	7.79E-01	0.00E+00	7.59E-01	0.00E+00	4.09E-03	7.63E-01	9.75E+00	1.0
Chromium III	4.80E+03	1.81E+05	6.86E+02	0.00E+00	2.71E+03	0.00E+00	2.40E+01	2.74E+03	5.72E+04	1.0
Chromium VI	5.76E+00	2.17E+02	4.97E+00	0.00E+00	3.25E+00	0.00E+00	2.88E-02	3.28E+00	6.85E+01	1.0
Cobalt	3.77E+01	4.42E+02	1.52E+02	0.00E+00	6.63E+00	0.00E+00	6.38E-01	7.27E+00	1.52E+03	1.0
Copper	5.44E+01	4.96E+01	2.61E+01	0.00E+00	7.44E-01	0.00E+00	1.95E+00	2.69E+00	4.64E+03	1.0
Cyanide	4.41E+03	4.41E+03	4.41E+03	0.00E+00	6.62E+01	0.00E+00	1.85E+00	6.80E+01	4.41E+03	1.0
Fluoride	2.01E+03	2.01E+03	7.29E+02	0.00E+00	3.02E+01	0.00E+00	8.46E-01	3.11E+01	2.01E+03	1.0
Iron									NA	NA
Lead	1.54E+01	2.77E+02	2.65E+01	0.00E+00	4.15E+00	0.00E+00	5.85E-01	4.74E+00	1.39E+03	1.0
Lithium	6.40E+01	5.56E+02	1.54E+01	0.00E+00	8.33E+00	0.00E+00	1.08E+00	9.41E+00	2.56E+03	1.0
Manganese	4.47E+03	3.70E+02	7.07E+02	0.00E+00	5.55E+00	0.00E+00	8.03E+00	1.36E+01	1.91E+04	1.0
Mercury	2.64E+00	7.73E-01	7.16E+00	0.00E+00	1.16E-02	0.00E+00	1.57E-02	2.73E-02	3.73E+01	1.0
Molybdenum	2.05E+00	1.71E+01	2.86E-01	0.00E+00	2.57E-01	0.00E+00	3.44E-03	2.60E-01	8.18E+00	1.0
Nickel	1.72E-01	8.81E+00	1.04E+00	0.00E+00	1.32E-01	0.00E+00	7.83E-04	1.33E-01	1.86E+00	1.0
Nitrate	3.29E+04	3.29E+04	3.29E+04	0.00E+00	4.93E+02	0.00E+00	1.38E+01	5.07E+02	3.29E+04	1.0
PCB	9.20E-01	2.41E+01	1.06E+02	0.00E+00	3.62E-01	0.00E+00	1.55E-03	3.64E-01	3.68E+00	1.0
Selenium	3.26E+00	3.19E+00	1.24E+00	0.00E+00	4.79E-02	0.00E+00	2.26E-03	5.01E-02	5.39E+00	1.0
Silver									NA	NA
Strontium	1.43E+05	1.59E+04	1.15E+02	0.00E+00	2.39E+02	0.00E+00	2.41E+01	2.63E+02	5.73E+04	1.0
TCDD (Dioxin)	3.21E-06	6.59E-05	1.09E-05	0.00E+00	9.89E-07	0.00E+00	6.14E-09	9.95E-07	1.46E-05	1.0
Thallium	1.23E-01	3.08E+01	3.79E+00	0.00E+00	4.62E-01	0.00E+00	1.29E-02	4.75E-01	3.08E+01	1.0
Tin	4.86E-01	1.62E+01	3.40E+00	0.00E+00	2.43E-01	0.00E+00	6.81E-03	2.50E-01	1.62E+01	1.0
Titanium									NA	NA
Uranium	1.93E+01	1.43E+02	9.09E-02	0.00E+00	2.15E+00	0.00E+00	9.54E-01	3.10E+00	2.27E+03	1.0
Vanadium	1.17E+00	1.06E+01	1.58E+00	0.00E+00	1.59E-01	0.00E+00	5.07E-02	2.10E-01	1.21E+02	1.0
Zinc	1.40E+02	6.26E+02	1.41E+02	0.00E+00	9.38E+00	0.00E+00	1.81E-01	9.56E+00	4.31E+02	1.0
Anthracene									NA	NA
Benzo(a)anthracene									NA	NA
Benzo(a)pyrene	2.44E-01	8.79E+01	7.85E+01	0.00E+00	1.32E+00	0.00E+00	1.16E-03	1.32E+00	2.76E+00	1.0
Benzo(b)fluoranthene									NA	NA
Benzo(ghi)perylene									NA	NA
Benzo(k)fluoranthene									NA	NA
Chrysene									NA	NA
Dibenz(a,h)anthracene									NA	NA
Fluoranthene										
Fluorene	5.77E+00	1.67E+03	1.59E+03	0.00E+00	2.50E+01	0.00E+00	2.38E-02	2.50E+01	5.66E+01	1.0
Indeno(1,2,3-cd)pyrene									NA	NA
Napthalene	1.03E+01	3.36E+03	3.78E+03	0.00E+00	5.05E+01	0.00E+00	4.97E-02	5.05E+01	1.18E+02	1.0
Phenanthrene									NA	NA
Pyrene									NA	NA

12

Exposure factors for calculations

IRf	***0.015***	***kg/kg BW/day***
Psoil	***0.028***	
Pplant	***0***	
Pinvert	***1***	
Psm	***0***	

278

Attachment 4
Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors
Receptor - Coyote (Insectivore)

		Uptake Factor Models												Estimated Concentrations			Intake						
ECOI	**TRV(Threshold)**	**Plant Model**	**B0**	**B1**	**BAF**	**Invertebrate Model**	**B0**	**B1**	**BAF**	**Small Mammal Model**	**B0**	**B1**	**BAF**	**Plant**	**Invertebrate**	**Small Mammal**	**Plant**	**Invertebrate**	**Small Mammal**	**Soil**	**Total**	**SSL Threshold**	**Target HQ**
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	0.19	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003	4.11E-01	1.22E+01	3.66E-02	0.00E+00	1.83E-01	0.00E+00	5.12E-03	1.88E-01	1.22E+01	1.0
Arsenic	1.23	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA	1.60E+03	4.12E+01	2.17E+00	0.00E+00	6.18E-01	0.00E+00	6.10E-01	1.23E+00	1.45E+03	1.0
Barium	NA	BAF			0.477	BAF			0.16	BAF			0.1121									NA	NA
Beryllium	0.58	BAF			0.01	BAF			1.18	BAF			0.003	3.23E-01	3.81E+01	9.70E-02	0.00E+00	5.72E-01	0.00E+00	1.36E-02	5.86E-01	3.23E+01	1.0
Boron	NA	BAF			4	BAF			1	BAF			0.01									NA	NA
Cadmium	0.84	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA	2.29E+00	5.52E+01	8.29E-01	0.00E+00	8.28E-01	0.00E+00	4.57E-03	8.33E-01	1.09E+01	1.0
Chromium III	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA									NA	NA
Chromium VI	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA									NA	NA
Cobalt	8.94	BAF			0.0248	BAF			0.291	BAF			0.1	4.59E+01	5.38E+02	1.85E+02	0.00E+00	8.07E+00	0.00E+00	7.77E-01	8.85E+00	1.85E+03	1.0
Copper	NA	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA									NA	NA
Cyanide	NA	BAF			1	BAF			1	BAF			1									NA	NA
Fluoride	NA	BAF			1	BAF			1	BAF			0.362									NA	NA
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	4.85	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA	1.56E+01	2.83E+02	2.68E+01	0.00E+00	4.24E+00	0.00E+00	6.00E-01	4.84E+00	1.43E+03	1.0
Lithium	NA	BAF			0.025	BAF			0.217	BAF			0.006									NA	NA
Manganese	46.69	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037	1.78E+04	9.51E+02	2.82E+03	0.00E+00	1.43E+01	0.00E+00	3.20E+01	4.63E+01	7.62E+04	1.0
Mercury	NA	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192									NA	NA
Molybdenum	NA	BAF			0.25	BAF			2.09	BAF			0.035									NA	NA
Nickel	NA	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA									NA	NA
Nitrate	NA	BAF			1	BAF			1	BAF			1									NA	NA
PCB	0.51	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79	1.15E+00	3.29E+01	1.33E+02	0.00E+00	4.93E-01	0.00E+00	1.94E-03	4.95E-01	4.62E+00	1.0
Selenium	NA	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA									NA	NA
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	NA	BAF			2.5	BAF			0.278	BAF			0.002									NA	NA
TCDD (Dioxin)	NA	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA									NA	NA
Thallium	0.83	BAF			0.004	BAF			1	BAF			0.123	2.13E-01	5.33E+01	6.55E+00	0.00E+00	7.99E-01	0.00E+00	2.24E-02	8.22E-01	5.33E+01	1.0
Tin	NA	BAF			0.03	BAF			1	BAF			0.21									NA	NA
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	NA	BAF			0.0085	BAF			0.063	BAF			0.00004									NA	NA
Vanadium	NA	BAF			0.0097	BAF			0.088	BAF			0.0131									NA	NA
Zinc	NA	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA									NA	NA
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	6.55	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49	6.80E-01	4.40E+02	3.93E+02	0.00E+00	6.60E+00	0.00E+00	5.80E-03	6.61E+00	1.38E+01	1.0
Benzo(b)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03									NA	NA
Indeno(1,2,3-cd)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	86.6	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94	1.58E+01	5.77E+03	6.49E+03	0.00E+00	8.65E+01	0.00E+00	8.53E-02	8.66E+01	2.03E+02	1.0
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA = not available
Exposure factors for calculations

IRf	*0.015*	*kg/kg BW/day*
Psoil	*0.028*	
Pplant	*0*	
Pinvert	*1*	
Psm	*0*	

279

Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors

Receptor - Coyote (Generalist)

		Uptake Factor Models												Estimated Concentrations			Intake						
ECOI	**TRV(NOAEL)**	**Plant Model**	**B0**	**B1**	**BAF**	**Invertebrate Model**	**B0**	**B1**	**BAF**	**Small Mammal Model**	**B0**	**B1**	**BAF**	**Plant**	**Invertebrate**	**Small Mammal**	**Plant**	**Invertebrate**	**Small Mammal**	**Soil**	**Total**	**SSL NOAEL**	**Target HQ**
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	0.06	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003	4.42E-01	1.32E+01	3.96E-02	0.00E+00	4.94E-02	4.45E-04	9.89E-03	5.98E-02	1.32E+01	1.0
Arsenic	0.32	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA	3.76E+02	1.48E+01	7.48E-01	0.00E+00	5.56E-02	8.42E-03	2.56E-01	3.20E-01	3.41E+02	1.0
Barium	51.8	BAF			0.477	BAF			0.16	BAF			0.1121	9.46E+03	3.17E+03	2.22E+03	0.00E+00	1.19E+01	2.50E+01	1.49E+01	5.18E+01	1.98E+04	1.0
Beryllium	0.532	BAF			0.01	BAF			1.18	BAF			0.003	1.03E+00	1.21E+02	3.08E-01	0.00E+00	4.55E-01	3.47E-03	7.71E-02	5.35E-01	1.03E+02	1.0
Boron	28	BAF			4	BAF			1	BAF			0.01	2.43E+04	6.07E+03	6.07E+01	0.00E+00	2.28E+01	6.83E-01	4.55E+00	2.80E+01	6.07E+03	1.0
Cadmium	0.77	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA	5.33E+00	1.89E+02	1.99E+00	0.00E+00	7.09E-01	2.24E-02	3.84E-02	7.70E-01	5.12E+01	1.0
Chromium III	2737	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	1.84E+04	6.93E+05	1.84E+03	0.00E+00	2.60E+03	2.06E+01	1.64E+02	2.79E+03	2.19E+05	1.0
Chromium VI	3.28	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	2.10E+01	7.89E+02	1.28E+01	0.00E+00	2.96E+00	1.44E-01	1.87E-01	3.29E+00	2.50E+02	1.0
Cobalt	7.34	BAF			0.0248	BAF			0.291	BAF			0.1	6.18E+01	7.25E+02	2.49E+02	0.00E+00	2.72E+00	2.80E+00	1.87E+00	7.39E+00	2.49E+03	1.0
Copper	2.67	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA	4.58E+01	4.42E+01	2.45E+01	0.00E+00	1.66E-01	2.75E-01	2.25E+00	2.69E+00	3.00E+03	1.0
Cyanide	68.7	BAF			1	BAF			1	BAF			1	4.23E+03	4.23E+03	4.23E+03	0.00E+00	1.59E+01	4.76E+01	3.17E+00	6.67E+01	4.23E+03	1.0
Fluoride	31.37	BAF			1	BAF			1	BAF			0.362	3.66E+03	3.66E+03	1.32E+03	0.00E+00	1.37E+01	1.49E+01	2.74E+00	3.14E+01	3.66E+03	1.0
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	4.7	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA	2.39E+01	5.24E+02	3.76E+01	0.00E+00	1.96E+00	4.23E-01	2.30E+00	4.69E+00	3.07E+03	1.0
Lithium	9.4	BAF			0.025	BAF			0.217	BAF			0.006	1.40E+02	1.22E+03	3.36E+01	0.00E+00	4.56E+00	3.79E-01	4.21E+00	9.15E+00	5.61E+03	1.0
Manganese	13.7	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037	2.56E+03	2.53E+02	4.05E+02	0.00E+00	9.49E-01	4.55E+00	8.20E+00	1.37E+01	1.09E+04	1.0
Mercury	0.027	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192	1.18E+00	6.49E-01	1.63E+00	0.00E+00	2.44E-03	1.83E-02	6.37E-03	2.71E-02	8.49E+00	1.0
Molybdenum	0.26	BAF			0.25	BAF			2.09	BAF			0.035	7.24E+00	6.05E+01	1.01E+00	0.00E+00	2.27E-01	1.14E-02	2.17E-02	2.60E-01	2.89E+01	1.0
Nickel	0.133	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA	4.14E-01	2.85E+01	1.80E+00	0.00E+00	1.07E-01	2.03E-02	4.52E-03	1.32E-01	6.02E+00	1.0
Nitrate	507	BAF			1	BAF			1	BAF			1	3.22E+04	3.22E+04	3.22E+04	0.00E+00	1.21E+02	3.62E+02	2.41E+01	5.07E+02	3.22E+04	1.0
PCB	0.36	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79	2.63E-01	4.38E+00	3.02E+01	0.00E+00	1.64E-02	3.40E-01	7.88E-04	3.57E-01	1.05E+00	1.0
Selenium	0.05	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA	8.04E+00	5.81E+00	1.69E+00	0.00E+00	2.18E-02	1.90E-02	9.15E-03	5.00E-02	1.22E+01	1.0
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	263	BAF			2.5	BAF			0.278	BAF			0.002	3.62E+05	4.03E+04	2.90E+02	0.00E+00	1.51E+02	3.26E+00	1.09E+02	2.63E+02	1.45E+05	1.0
TCDD (Dioxin)	0.000001	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA	7.46E-06	1.78E-04	2.75E-05	0.00E+00	6.69E-07	3.09E-07	2.54E-08	1.00E-06	3.39E-05	1.0
Thallium	0.48	BAF			0.004	BAF			1	BAF			0.123	3.26E-01	8.16E+01	1.00E+01	0.00E+00	3.06E-01	1.13E-01	6.12E-02	4.80E-01	8.16E+01	1.0
Tin	0.25	BAF			0.03	BAF			1	BAF			0.21	1.08E+00	3.61E+01	7.57E+00	0.00E+00	1.35E-01	8.52E-02	2.70E-02	2.48E-01	3.61E+01	1.0
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	3.07	BAF			0.0085	BAF			0.063	BAF			0.00004	2.64E+01	1.96E+02	1.24E-01	0.00E+00	7.34E-01	1.40E-03	2.33E+00	3.06E+00	3.11E+03	1.0
Vanadium	0.21	BAF			0.0097	BAF			0.088	BAF			0.0131	1.59E+00	1.44E+01	2.15E+00	0.00E+00	5.41E-02	2.42E-02	1.23E-01	2.01E-01	1.64E+02	1.0
Zinc	9.61	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA	4.75E+02	1.29E+03	1.66E+02	0.00E+00	4.83E+00	1.87E+00	2.92E+00	9.61E+00	3.89E+03	1.0
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	1.31	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49	2.56E-01	9.48E+01	8.47E+01	0.00E+00	3.55E-01	9.52E-01	2.23E-03	1.31E+00	2.97E+00	1.0
Benzo(b)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	25	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03	5.93E+00	1.72E+03	1.64E+03	0.00E+00	6.46E+00	1.85E+01	4.40E-02	2.50E+01	5.86E+01	1.0
Indeno(1,2,3-cd)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	50	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94	9.56E+00	3.04E+03	3.42E+03	0.00E+00	1.14E+01	3.85E+01	8.04E-02	5.00E+01	1.07E+02	1.0
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA = not available

Exposure factors for calculations

IRf	*0.015*	*kg/kg BW/day*
Psoil	*0.05*	
Pplant	*0*	
Pinvert	*0.25*	
Psm	*0.75*	

280

Attachment 4
Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors
Receptor - Coyote (Generalist)

		Uptake Factor Models												Estimated Concentrations			Intake						
ECOI	**TRV(Threshold)**	**Plant Model**	**B0**	**B1**	**BAF**	**Invertebrate Model**	**B0**	**B1**	**BAF**	**Small Mammal Model**	**B0**	**B1**	**BAF**	**Plant**	**Invertebrate**	**Small Mammal**	**Plant**	**Invertebrate**	**Small Mammal**	**Soil**	**Total**	**SSL Threshold**	**Target HQ**
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	0.19	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003	1.30E+00	4.17E+01	1.25E-01	0.00E+00	1.57E-01	1.41E-03	3.13E-02	1.89E-01	4.17E+01	1.0
Arsenic	1.23	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA	1.54E+03	4.00E+01	2.10E+00	0.00E+00	1.50E-01	2.37E-02	1.04E+00	1.22E+00	1.39E+03	1.0
Barium	NA	BAF			0.477	BAF			0.16	BAF			0.1121									NA	NA
Beryllium	0.58	BAF			0.01	BAF			1.18	BAF			0.003	1.12E+00	1.32E+02	3.36E-01	0.00E+00	4.96E-01	3.78E-03	8.40E-02	5.84E-01	1.12E+02	1.0
Boron	NA	BAF			4	BAF			1	BAF			0.01									NA	NA
Cadmium	0.84	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA	5.69E+00	2.08E+02	2.13E+00	0.00E+00	7.80E-01	2.40E-02	4.33E-02	8.47E-01	5.77E+01	1.0
Chromium III	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA									NA	NA
Chromium VI	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA									NA	NA
Cobalt	8.94	BAF			0.0248	BAF			0.291	BAF			0.1	7.40E+01	8.68E+02	2.98E+02	0.00E+00	3.26E+00	3.36E+00	2.24E+00	8.85E+00	2.98E+03	1.0
Copper	NA	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA									NA	NA
Cyanide	NA	BAF			1	BAF			1	BAF			1									NA	NA
Fluoride	NA	BAF			1	BAF			1	BAF			0.362									NA	NA
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	4.85	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA	2.43E+01	5.36E+02	3.80E+01	0.00E+00	2.01E+00	4.28E-01	2.37E+00	4.80E+00	3.15E+03	1.0
Lithium	NA	BAF			0.025	BAF			0.217	BAF			0.006									NA	NA
Manganese	46.69	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037	8.90E+03	5.92E+02	1.41E+03	0.00E+00	2.22E+00	1.58E+01	2.85E+01	4.66E+01	3.80E+04	1.0
Mercury	NA	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192									NA	NA
Molybdenum	NA	BAF			0.25	BAF			2.09	BAF			0.035									NA	NA
Nickel	NA	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA									NA	NA
Nitrate	NA	BAF			1	BAF			1	BAF			1									NA	NA
PCB	0.51	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79	3.76E-01	7.14E+00	4.33E+01	0.00E+00	2.68E-02	4.87E-01	1.13E-03	5.15E-01	1.50E+00	1.0
Selenium	NA	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA									NA	NA
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	NA	BAF			2.5	BAF			0.278	BAF			0.002									NA	NA
TCDD (Dioxin)	NA	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA									NA	NA
Thallium	0.83	BAF			0.004	BAF			1	BAF			0.123	5.59E-01	1.40E+02	1.72E+01	0.00E+00	5.24E-01	1.93E-01	1.05E-01	8.22E-01	1.40E+02	1.0
Tin	NA	BAF			0.03	BAF			1	BAF			0.21									NA	NA
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	NA	BAF			0.0085	BAF			0.063	BAF			0.00004									NA	NA
Vanadium	NA	BAF			0.0097	BAF			0.088	BAF			0.0131									NA	NA
Zinc	NA	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA									NA	NA
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	6.55	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49	7.17E-01	4.79E+02	4.27E+02	0.00E+00	1.79E+00	4.81E+00	1.13E-02	6.62E+00	1.50E+01	1.0
Benzo(b)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03									NA	NA
Indeno(1,2,3-cd)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	86.6	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94	1.48E+01	5.27E+03	5.93E+03	0.00E+00	1.98E+01	6.67E+01	1.39E-01	8.66E+01	1.86E+02	1.0
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA = not available

Exposure factors for calculations

IRf	*0.015*	*kg/kg BW/day*
Psoil	*0.05*	
Pplant	*0*	
Pinvert	*0.25*	
Psm	*0.75*	

281

Attachment 4
Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors
Receptor - Prairie Dog

		Uptake Factor Models												Estimated Concentrations			Intake						
ECOI	**TRV(NOAEL)**	**Plant Model**	**B0**	**B1**	**BAF**	**Invertebrate Model**	**B0**	**B1**	**BAF**	**Small Mammal Model**	**B0**	**B1**	**BAF**	**Plant**	**Invertebrate**	**Small Mammal**	**Plant**	**Invertebrate**	**Small Mammal**	**Soil**	**Total**	**SSL NOAEL**	**Target HQ**
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	0.06	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003	6.14E-01	1.87E+01	5.62E-02	1.78E-02	0.00E+00	0.00E+00	4.18E-02	5.96E-02	1.87E+01	1.0
Arsenic	0.32	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA	1.03E+01	1.17E+00	5.31E-02	2.99E-01	0.00E+00	0.00E+00	2.09E-02	3.20E-01	9.35E+00	1.0
Barium	51.8	BAF			0.477	BAF			0.16	BAF			0.1121	1.54E+03	5.16E+02	3.61E+02	4.46E+01	0.00E+00	0.00E+00	7.20E+00	5.18E+01	3.22E+03	1.0
Beryllium	0.532	BAF			0.01	BAF			1.18	BAF			0.003	2.11E+00	2.49E+02	6.33E-01	6.11E-02	0.00E+00	0.00E+00	4.71E-01	5.32E-01	2.11E+02	1.0
Boron	28	BAF			4	BAF			1	BAF			0.01	9.47E+02	2.37E+02	2.37E+00	2.75E+01	0.00E+00	0.00E+00	5.29E-01	2.80E+01	2.37E+02	1.0
Cadmium	0.77	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA	1.11E+01	5.54E+02	4.28E+00	3.23E-01	0.00E+00	0.00E+00	4.41E-01	7.64E-01	1.98E+02	1.0
Chromium III	2737	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	4.92E+04	1.85E+06	3.77E+03	1.43E+03	0.00E+00	0.00E+00	1.31E+03	2.74E+03	5.86E+05	1.0
Chromium VI	3.28	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	5.90E+01	2.22E+03	2.73E+01	1.71E+00	0.00E+00	0.00E+00	1.57E+00	3.28E+00	7.03E+02	1.0
Cobalt	7.34	BAF			0.0248	BAF			0.291	BAF			0.1	6.10E+01	7.16E+02	2.46E+02	1.77E+00	0.00E+00	0.00E+00	5.50E+00	7.27E+00	2.46E+03	1.0
Copper	2.67	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA	2.77E+01	3.16E+01	2.04E+01	8.03E-01	0.00E+00	0.00E+00	1.87E+00	2.67E+00	8.38E+02	1.0
Cyanide	68.7	BAF			1	BAF			1	BAF			1	2.20E+03	2.20E+03	2.20E+03	6.38E+01	0.00E+00	0.00E+00	4.91E+00	6.87E+01	2.20E+03	1.0
Fluoride	31.37	BAF			1	BAF			1	BAF			0.362	9.94E+02	9.94E+02	3.60E+02	2.88E+01	0.00E+00	0.00E+00	2.22E+00	3.11E+01	9.94E+02	1.0
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	4.7	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA	1.80E+01	3.48E+02	3.00E+01	5.23E-01	0.00E+00	0.00E+00	4.13E+00	4.65E+00	1.85E+03	1.0
Lithium	9.4	BAF			0.025	BAF			0.217	BAF			0.006	7.94E+01	6.90E+02	1.91E+01	2.30E+00	0.00E+00	0.00E+00	7.10E+00	9.40E+00	3.18E+03	1.0
Manganese	13.7	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037	5.17E+01	1.77E+01	8.18E+00	1.50E+00	0.00E+00	0.00E+00	4.94E-01	1.99E+00	2.21E+02	0.1
Mercury	0.027	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192	6.89E-01	5.78E-01	6.05E-01	2.00E-02	0.00E+00	0.00E+00	7.03E-03	2.70E-02	3.15E+00	1.0
Molybdenum	0.26	BAF			0.25	BAF			2.09	BAF			0.035	6.79E+00	5.67E+01	9.50E-01	1.97E-01	0.00E+00	0.00E+00	6.06E-02	2.57E-01	2.71E+01	1.0
Nickel	0.133	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA	1.65E+00	1.81E+02	4.27E+00	4.80E-02	0.00E+00	0.00E+00	8.56E-02	1.34E-01	3.83E+01	1.0
Nitrate	507	BAF			1	BAF			1	BAF			1	1.62E+04	1.62E+04	1.62E+04	4.71E+02	0.00E+00	0.00E+00	3.62E+01	5.07E+02	1.62E+04	1.0
PCB	0.36	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79	9.49E+00	5.78E+02	1.09E+03	2.75E-01	0.00E+00	0.00E+00	8.48E-02	3.60E-01	3.80E+01	1.0
Selenium	0.05	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA	1.58E+00	1.97E+00	9.72E-01	4.59E-02	0.00E+00	0.00E+00	6.26E-03	5.22E-02	2.80E+00	1.0
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	263	BAF			2.5	BAF			0.278	BAF			0.002	8.80E+03	9.78E+02	7.04E+00	2.55E+02	0.00E+00	0.00E+00	7.86E+00	2.63E+02	3.52E+03	1.0
TCDD (Dioxin)	0.000001	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA	2.55E-05	7.64E-04	1.06E-04	7.41E-07	0.00E+00	0.00E+00	2.59E-07	1.00E-06	1.16E-04	1.0
Thallium	0.48	BAF			0.004	BAF			1	BAF			0.123	8.17E-01	2.04E+02	2.51E+01	2.37E-02	0.00E+00	0.00E+00	4.56E-01	4.80E-01	2.04E+02	1.0
Tin	0.25	BAF			0.03	BAF			1	BAF			0.21	2.42E+00	8.06E+01	1.69E+01	7.01E-02	0.00E+00	0.00E+00	1.80E-01	2.50E-01	8.06E+01	1.0
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	3.07	BAF			0.0085	BAF			0.063	BAF			0.00004	1.04E+01	7.72E+01	4.90E-02	3.02E-01	0.00E+00	0.00E+00	2.74E+00	3.04E+00	1.23E+03	1.0
Vanadium	0.21	BAF			0.0097	BAF			0.088	BAF			0.0131	8.10E-01	7.35E+00	1.09E+00	2.35E-02	0.00E+00	0.00E+00	1.87E-01	2.10E-01	8.35E+01	1.0
Zinc	9.61	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA	2.44E+02	8.69E+02	1.52E+02	7.08E+00	0.00E+00	0.00E+00	2.62E+00	9.70E+00	1.17E+03	1.0
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	1.31	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49	6.66E+00	1.60E+04	1.43E+04	1.93E-01	0.00E+00	0.00E+00	1.12E+00	1.32E+00	5.03E+02	1.0
Benzo(b)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	25	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03	2.79E+02	2.24E+05	2.14E+05	8.10E+00	0.00E+00	0.00E+00	1.70E+01	2.51E+01	7.63E+03	1.0
Indeno(1,2,3-cd)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	50	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94	5.01E+02	4.54E+05	5.11E+05	1.45E+01	0.00E+00	0.00E+00	3.57E+01	5.03E+01	1.60E+04	1.0
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA = not available
Exposure factors for calculations

IRf	*0.029*	*kg/kg BW/day*
Psoil	*0.077*	
Pplant	*1*	
Pinvert	*0*	
Psm	*0*	

282

Attachment 4
Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors
Receptor - Prairie Dog

		Uptake Factor Models												Estimated Concentrations			Intake						
ECOI	**TRV(Threshold)**	**Plant Model**	**B0**	**B1**	**BAF**	**Invertebrate Model**	**B0**	**B1**	**BAF**	**Small Mammal Model**	**B0**	**B1**	**BAF**	**Plant**	**Invertebrate**	**Small Mammal**	**Plant**	**Invertebrate**	**Small Mammal**	**Soil**	**Total**	**SSL Threshold**	**Target HQ**
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	0.19	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003	1.84E+00	6.04E+01	1.81E-01	5.33E-02	0.00E+00	0.00E+00	1.35E-01	1.88E-01	6.04E+01	1.0
Arsenic	1.23	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA	3.96E+01	3.03E+00	1.43E-01	1.15E+00	0.00E+00	0.00E+00	8.03E-02	1.23E+00	3.59E+01	1.0
Barium	NA	BAF			0.477	BAF			0.16	BAF			0.1121									NA	NA
Beryllium	0.58	BAF			0.01	BAF			1.18	BAF			0.003	2.30E+00	2.71E+02	6.90E-01	6.67E-02	0.00E+00	0.00E+00	5.13E-01	5.80E-01	2.30E+02	1.0
Boron	NA	BAF			4	BAF			1	BAF			0.01									NA	NA
Cadmium	0.84	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA	1.18E+01	6.03E+02	4.54E+00	3.42E-01	0.00E+00	0.00E+00	4.91E-01	8.33E-01	2.20E+02	1.0
Chromium III	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA									NA	NA
Chromium VI	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA									NA	NA
Cobalt	8.94	BAF			0.0248	BAF			0.291	BAF			0.1	7.43E+01	8.72E+02	3.00E+02	2.16E+00	0.00E+00	0.00E+00	6.69E+00	8.85E+00	3.00E+03	1.0
Copper	NA	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA									NA	NA
Cyanide	NA	BAF			1	BAF			1	BAF			1									NA	NA
Fluoride	NA	BAF			1	BAF			1	BAF			0.362									NA	NA
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	4.85	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA	1.84E+01	3.58E+02	3.05E+01	5.33E-01	0.00E+00	0.00E+00	4.27E+00	4.80E+00	1.91E+03	1.0
Lithium	NA	BAF			0.025	BAF			0.217	BAF			0.006									NA	NA
Manganese	46.69	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037	1.21E+03	1.52E+02	1.92E+02	3.51E+01	0.00E+00	0.00E+00	1.16E+01	4.67E+01	5.18E+03	1.0
Mercury	NA	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192									NA	NA
Molybdenum	NA	BAF			0.25	BAF			2.09	BAF			0.035									NA	NA
Nickel	NA	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA									NA	NA
Nitrate	NA	BAF			1	BAF			1	BAF			1									NA	NA
PCB	0.51	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79	1.33E+01	9.16E+02	1.53E+03	3.86E-01	0.00E+00	0.00E+00	1.19E-01	5.05E-01	5.32E+01	1.0
Selenium	NA	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA									NA	NA
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	NA	BAF			2.5	BAF			0.278	BAF			0.002									NA	NA
TCDD (Dioxin)	NA	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA									NA	NA
Thallium	0.83	BAF			0.004	BAF			1	BAF			0.123	1.40E+00	3.50E+02	4.30E+01	4.06E-02	0.00E+00	0.00E+00	7.81E-01	8.22E-01	3.50E+02	1.0
Tin	NA	BAF			0.03	BAF			1	BAF			0.21									NA	NA
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	NA	BAF			0.0085	BAF			0.063	BAF			0.00004									NA	NA
Vanadium	NA	BAF			0.0097	BAF			0.088	BAF			0.0131									NA	NA
Zinc	NA	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA									NA	NA
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	6.55	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49	1.93E+01	8.56E+04	7.65E+04	5.60E-01	0.00E+00	0.00E+00	5.99E+00	6.55E+00	2.68E+03	1.0
Benzo(b)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03									NA	NA
Indeno(1,2,3-cd)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	86.6	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94	7.92E+02	8.11E+05	9.12E+05	2.30E+01	0.00E+00	0.00E+00	6.37E+01	8.67E+01	2.85E+04	1.0
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA = not available

Exposure factors for calculations

IRf	*0.029*	*kg/kg BW/day*
Psoil	*0.077*	
Pplant	*1*	
Pinvert	*0*	
Psm	*0*	

283

Attachment 4
Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors
Receptor - Deer Mouse (Insectivore)

		Uptake Factor Models												Estimated Concentrations			Intake						
ECOI	**TRV(NOAEL)**	**Plant Model**	**B0**	**B1**	**BAF**	**Invertebrate Model**	**B0**	**B1**	**BAF**	**Small Mammal Model**	**B0**	**B1**	**BAF**	**Plant**	**Invertebrate**	**Small Mammal**	**Plant**	**Invertebrate**	**Small Mammal**	**Soil**	**Total**	**SSL NOAEL**	
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	0.06	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003	3.59E-02	9.05E-01	2.71E-03	0.00E+00	5.88E-02	0.00E+00	1.18E-03	6.00E-02	9.05E-01	1.0
Arsenic	0.32	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA	5.67E+01	3.90E+00	1.86E-01	0.00E+00	2.53E-01	0.00E+00	6.68E-02	3.20E-01	5.14E+01	1.0
Barium	51.8	BAF			0.477	BAF			0.16	BAF			0.1121	2.11E+03	7.08E+02	4.96E+02	0.00E+00	4.60E+01	0.00E+00	5.76E+00	5.18E+01	4.43E+03	1.0
Beryllium	0.532	BAF			0.01	BAF			1.18	BAF			0.003	6.82E-02	8.05E+00	2.05E-02	0.00E+00	5.23E-01	0.00E+00	8.87E-03	5.32E-01	6.82E+00	1.0
Boron	28	BAF			4	BAF			1	BAF			0.01	1.69E+03	4.22E+02	4.22E+00	0.00E+00	2.75E+01	0.00E+00	5.49E-01	2.80E+01	4.22E+02	1.0
Cadmium	0.77	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA	7.93E-01	1.18E+01	2.77E-01	0.00E+00	7.68E-01	0.00E+00	2.03E-03	7.70E-01	1.56E+00	1.0
Chromium III	2737	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	1.11E+03	4.18E+04	2.35E+02	0.00E+00	2.72E+03	0.00E+00	1.72E+01	2.74E+03	1.32E+04	1.0
Chromium VI	3.28	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	1.33E+00	5.01E+01	1.70E+00	0.00E+00	3.26E+00	0.00E+00	2.06E-02	3.28E+00	1.59E+01	1.0
Cobalt	7.34	BAF			0.0248	BAF			0.291	BAF			0.1	9.00E+00	1.06E+02	3.63E+01	0.00E+00	6.87E+00	0.00E+00	4.72E-01	7.34E+00	3.63E+02	1.0
Copper	2.67	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA	2.44E+01	2.90E+01	1.94E+01	0.00E+00	1.88E+00	0.00E+00	7.87E-01	2.67E+00	6.05E+02	1.0
Cyanide	68.7	BAF			1	BAF			1	BAF			1	1.04E+03	1.04E+03	1.04E+03	0.00E+00	6.74E+01	0.00E+00	1.35E+00	6.87E+01	1.04E+03	1.0
Fluoride	31.37	BAF			1	BAF			1	BAF			0.362	4.73E+02	4.73E+02	1.71E+02	0.00E+00	3.08E+01	0.00E+00	6.15E-01	3.14E+01	4.73E+02	1.0
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	4.7	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA	5.76E+00	6.75E+01	1.22E+01	0.00E+00	4.39E+00	0.00E+00	3.15E-01	4.70E+00	2.42E+02	1.0
Lithium	9.4	BAF			0.025	BAF			0.217	BAF			0.006	1.53E+01	1.32E+02	3.66E+00	0.00E+00	8.61E+00	0.00E+00	7.93E-01	9.40E+00	6.10E+02	1.0
Manganese	13.7	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037	9.55E+02	1.29E+02	1.51E+02	0.00E+00	8.40E+00	0.00E+00	5.30E+00	1.37E+01	4.08E+03	1.0
Mercury	0.027	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192	1.45E-01	4.12E-01	3.43E-02	0.00E+00	2.68E-02	0.00E+00	2.32E-04	2.70E-02	1.79E-01	1.0
Molybdenum	0.26	BAF			0.25	BAF			2.09	BAF			0.035	4.74E-01	3.96E+00	6.64E-02	0.00E+00	2.58E-01	0.00E+00	2.46E-03	2.60E-01	1.90E+00	1.0
Nickel	0.133	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA	5.76E-02	2.04E+00	5.28E-01	0.00E+00	1.32E-01	0.00E+00	5.60E-04	1.33E-01	4.31E-01	1.0
Nitrate	507	BAF			1	BAF			1	BAF			1	7.65E+03	7.65E+03	7.65E+03	0.00E+00	4.97E+02	0.00E+00	9.94E+00	5.07E+02	7.65E+03	1.0
PCB	0.36	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79	3.11E-01	5.51E+00	3.58E+01	0.00E+00	3.58E-01	0.00E+00	1.62E-03	3.60E-01	1.24E+00	1.0
Selenium	0.05	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA	3.72E-01	7.54E-01	5.93E-01	0.00E+00	4.90E-02	0.00E+00	9.80E-04	5.00E-02	7.54E-01	1.0
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	263	BAF			2.5	BAF			0.278	BAF			0.002	3.39E+04	3.77E+03	2.72E+01	0.00E+00	2.45E+02	0.00E+00	1.77E+01	2.63E+02	1.36E+04	1.0
TCDD (Dioxin)	0.000001	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA	9.34E-07	1.53E-05	2.80E-06	0.00E+00	9.94E-07	0.00E+00	5.52E-09	1.00E-06	4.25E-06	1.0
Thallium	0.48	BAF			0.004	BAF			1	BAF			0.123	2.90E-02	7.24E+00	8.90E-01	0.00E+00	4.71E-01	0.00E+00	9.41E-03	4.80E-01	7.24E+00	1.0
Tin	0.25	BAF			0.03	BAF			1	BAF			0.21	1.13E-01	3.77E+00	7.92E-01	0.00E+00	2.45E-01	0.00E+00	4.90E-03	2.50E-01	3.77E+00	1.0
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	3.07	BAF			0.0085	BAF			0.063	BAF			0.00004	4.84E+00	3.58E+01	2.28E-02	0.00E+00	2.33E+00	0.00E+00	7.40E-01	3.07E+00	5.69E+02	1.0
Vanadium	0.21	BAF			0.0097	BAF			0.088	BAF			0.0131	2.90E-01	2.63E+00	3.92E-01	0.00E+00	1.71E-01	0.00E+00	3.89E-02	2.10E-01	2.99E+01	1.0
Zinc	9.61	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA	1.22E+01	1.48E+02	1.02E+02	0.00E+00	9.60E+00	0.00E+00	6.88E-03	9.61E+00	5.29E+00	1.0
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	1.31	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49	9.58E-02	2.01E+01	1.80E+01	0.00E+00	1.31E+00	0.00E+00	8.21E-04	1.31E+00	6.31E-01	1.0
Benzo(b)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	25	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03	1.81E+00	3.84E+02	3.66E+02	0.00E+00	2.50E+01	0.00E+00	1.70E-02	2.50E+01	1.31E+01	1.0
Indeno(1,2,3-cd)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	50	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94	3.22E+00	7.69E+02	8.65E+02	0.00E+00	5.00E+01	0.00E+00	3.52E-02	5.00E+01	2.71E+01	1.0
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA = not available
Exposure factors for calculations

IRf	*0.065*	***kg/kg BW/day***
Psoil	*0.02*	
Pplant	*0*	
Pinvert	*1*	
Psm	*0*	

284

Attachment 4
Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors
Receptor - Deer Mouse (Insectivore)

		Uptake Factor Models												Estimated Concentrations			Intake						
ECOI	**TRV(Threshold)**	**Plant Model**	**B0**	**B1**	**BAF**	**Invertebrate Model**	**B0**	**B1**	**BAF**	**Small Mammal Model**	**B0**	**B1**	**BAF**	**Plant**	**Invertebrate**	**Small Mammal**	**Plant**	**Invertebrate**	**Small Mammal**	**Soil**	**Total**	**SSL Threshold**	
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	0.19	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003	1.06E-01	2.87E+00	8.60E-03	0.00E+00	1.86E-01	0.00E+00	3.73E-03	1.90E-01	2.87E+00	1.0
Arsenic	1.23	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA	3.18E+02	1.32E+01	6.60E-01	0.00E+00	8.55E-01	0.00E+00	3.75E-01	1.23E+00	2.88E+02	1.0
Barium	NA	BAF			0.477	BAF			0.16	BAF			0.1121									NA	NA
Beryllium	0.58	BAF			0.01	BAF			1.18	BAF			0.003	7.44E-02	8.77E+00	2.23E-02	0.00E+00	5.70E-01	0.00E+00	9.67E-03	5.80E-01	7.44E+00	1.0
Boron	NA	BAF			4	BAF			1	BAF			0.01									NA	NA
Cadmium	0.84	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA	8.42E-01	1.29E+01	2.94E-01	0.00E+00	8.38E-01	0.00E+00	2.27E-03	8.40E-01	1.74E+00	1.0
Chromium III	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA									NA	NA
Chromium VI	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA									NA	NA
Cobalt	8.94	BAF			0.0248	BAF			0.291	BAF			0.1	1.10E+01	1.29E+02	4.42E+01	0.00E+00	8.37E+00	0.00E+00	5.75E-01	8.94E+00	4.42E+02	1.0
Copper	NA	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA									NA	NA
Cyanide	NA	BAF			1	BAF			1	BAF			1									NA	NA
Fluoride	NA	BAF			1	BAF			1	BAF			0.362									NA	NA
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	4.85	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA	5.89E+00	6.96E+01	1.24E+01	0.00E+00	4.52E+00	0.00E+00	3.27E-01	4.85E+00	2.51E+02	1.0
Lithium	NA	BAF			0.025	BAF			0.217	BAF			0.006									NA	NA
Manganese	46.69	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037	4.23E+03	3.57E+02	6.69E+02	0.00E+00	2.32E+01	0.00E+00	2.35E+01	4.67E+01	1.81E+04	1.0
Mercury	NA	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192									NA	NA
Molybdenum	NA	BAF			0.25	BAF			2.09	BAF			0.035									NA	NA
Nickel	NA	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA									NA	NA
Nitrate	NA	BAF			1	BAF			1	BAF			1									NA	NA
PCB	0.51	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79	4.02E-01	7.81E+00	4.63E+01	0.00E+00	5.08E-01	0.00E+00	2.09E-03	5.10E-01	1.61E+00	1.0
Selenium	NA	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA									NA	NA
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	NA	BAF			2.5	BAF			0.278	BAF			0.002									NA	NA
TCDD (Dioxin)	NA	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA									NA	NA
Thallium	0.83	BAF			0.004	BAF			1	BAF			0.123	5.01E-02	1.25E+01	1.54E+00	0.00E+00	8.14E-01	0.00E+00	1.63E-02	8.30E-01	1.25E+01	1.0
Tin	NA	BAF			0.03	BAF			1	BAF			0.21									NA	NA
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	NA	BAF			0.0085	BAF			0.063	BAF			0.00004									NA	NA
Vanadium	NA	BAF			0.0097	BAF			0.088	BAF			0.0131									NA	NA
Zinc	NA	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA									NA	NA
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	6.55	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49	2.66E-01	1.01E+02	8.99E+01	0.00E+00	6.55E+00	0.00E+00	4.10E-03	6.55E+00	3.16E+00	1.0
Benzo(b)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03									NA	NA
Indeno(1,2,3-cd)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	86.6	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94	4.97E+00	1.33E+03	1.50E+03	0.00E+00	8.65E+01	0.00E+00	6.09E-02	8.66E+01	4.69E+01	1.0
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA = not available
Exposure factors for calculations
IRf 0.065 *kg/kg BW/day*
Psoil 0.02
Pplant 0
Pinvert 1
Psm 0

285

Attachment 4

Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors

Receptor - Deer Mouse (Herbivore)

		Uptake Factor Models												Estimated Concentrations			Intake						
ECOI	TRV(NOAEL)	Plant Model	B0	B1	BAF	Invertebrate Model	B0	B1	BAF	Small Mammal Model	B0	B1	BAF	Plant	Invertebrate	Small Mammal	Plant	Invertebrate	Small Mammal	Soil	Total	SSL NOAEL	Target HQ
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	0.06	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003	3.38E-01	9.89E+00	2.97E-02	3.75E-02	0.00E+00	0.00E+00	2.20E-02	5.94E-02	9.89E+00	1.0
Arsenic	0.32	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA	2.83E+00	4.70E-01	2.05E-02	3.14E-01	0.00E+00	0.00E+00	5.70E-03	3.20E-01	2.57E+00	1.0
Barium	51.8	BAF			0.477	BAF			0.16	BAF			0.1121	4.43E+02	1.49E+02	1.04E+02	4.92E+01	0.00E+00	0.00E+00	2.06E+00	5.13E+01	9.30E+02	1.0
Beryllium	0.532	BAF			0.01	BAF			1.18	BAF			0.003	1.60E+00	1.89E+02	4.79E-01	1.77E-01	0.00E+00	0.00E+00	3.55E-01	5.32E-01	1.60E+02	1.0
Boron	28	BAF			4	BAF			1	BAF			0.01	2.48E+02	6.21E+01	6.21E-01	2.76E+01	0.00E+00	0.00E+00	1.38E-01	2.77E+01	6.21E+01	1.0
Cadmium	0.77	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA	5.80E+00	2.14E+02	2.18E+00	6.44E-01	0.00E+00	0.00E+00	1.33E-01	7.77E-01	5.99E+01	1.0
Chromium III	2737	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	1.99E+04	7.50E+05	1.94E+03	2.21E+03	0.00E+00	0.00E+00	5.26E+02	2.74E+03	2.37E+05	1.0
Chromium VI	3.28	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA	2.36E+01	8.89E+02	1.40E+01	2.62E+00	0.00E+00	0.00E+00	6.24E-01	3.25E+00	2.81E+02	1.0
Cobalt	7.34	BAF			0.0248	BAF			0.291	BAF			0.1	3.66E+01	4.30E+02	1.48E+02	4.06E+00	0.00E+00	0.00E+00	3.28E+00	7.34E+00	1.48E+03	1.0
Copper	2.67	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA	1.83E+01	2.40E+01	1.75E+01	2.04E+00	0.00E+00	0.00E+00	6.54E-01	2.69E+00	2.95E+02	1.0
Cyanide	68.7	BAF			1	BAF			1	BAF			1	6.07E+02	6.07E+02	6.07E+02	6.74E+01	0.00E+00	0.00E+00	1.35E+00	6.87E+01	6.07E+02	1.0
Fluoride	31.37	BAF			1	BAF			1	BAF			0.362	2.77E+02	2.77E+02	1.00E+02	3.08E+01	0.00E+00	0.00E+00	6.15E-01	3.14E+01	2.77E+02	1.0
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	4.7	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA	1.51E+01	2.69E+02	2.61E+01	1.67E+00	0.00E+00	0.00E+00	2.98E+00	4.66E+00	1.34E+03	1.0
Lithium	9.4	BAF			0.025	BAF			0.217	BAF			0.006	4.70E+01	4.08E+02	1.13E+01	5.22E+00	0.00E+00	0.00E+00	4.18E+00	9.40E+00	1.88E+03	1.0
Manganese	13.7	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037	1.14E+02	3.03E+01	1.80E+01	1.26E+01	0.00E+00	0.00E+00	1.08E+00	1.37E+01	4.86E+02	1.0
Mercury	0.027	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192	2.36E-01	4.58E-01	8.43E-02	2.62E-02	0.00E+00	0.00E+00	9.75E-04	2.72E-02	4.39E-01	1.0
Molybdenum	0.26	BAF			0.25	BAF			2.09	BAF			0.035	2.17E+00	1.81E+01	3.04E-01	2.41E-01	0.00E+00	0.00E+00	1.93E-02	2.60E-01	8.68E+00	1.0
Nickel	0.133	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA	8.76E-01	7.75E+01	2.88E+00	9.73E-02	0.00E+00	0.00E+00	3.64E-02	1.34E-01	1.64E+01	1.0
Nitrate	507	BAF			1	BAF			1	BAF			1	4.48E+03	4.48E+03	4.48E+03	4.97E+02	0.00E+00	0.00E+00	9.94E+00	5.07E+02	4.48E+03	1.0
PCB	0.36	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79	2.97E+00	1.19E+02	3.42E+02	3.30E-01	0.00E+00	0.00E+00	2.64E-02	3.56E-01	1.19E+01	1.0
Selenium	0.05	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA	4.37E-01	8.39E-01	6.27E-01	4.85E-02	0.00E+00	0.00E+00	1.94E-03	5.04E-02	8.72E-01	1.0
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	263	BAF			2.5	BAF			0.278	BAF			0.002	2.35E+03	2.61E+02	1.88E+00	2.61E+02	0.00E+00	0.00E+00	2.09E+00	2.63E+02	9.40E+02	1.0
TCDD (Dioxin)	0.000001	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA	8.26E-06	2.01E-04	3.07E-05	9.17E-07	0.00E+00	0.00E+00	8.33E-08	1.00E-06	3.75E-05	1.0
Thallium	0.48	BAF			0.004	BAF			1	BAF			0.123	7.21E-01	1.80E+02	2.22E+01	8.00E-02	0.00E+00	0.00E+00	4.00E-01	4.80E-01	1.80E+02	1.0
Tin	0.25	BAF			0.03	BAF			1	BAF			0.21	1.35E+00	4.50E+01	9.46E+00	1.50E-01	0.00E+00	0.00E+00	1.00E-01	2.50E-01	4.50E+01	1.0
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	3.07	BAF			0.0085	BAF			0.063	BAF			0.00004	8.25E+00	6.11E+01	3.88E-02	9.16E-01	0.00E+00	0.00E+00	2.15E+00	3.07E+00	9.70E+02	1.0
Vanadium	0.21	BAF			0.0097	BAF			0.088	BAF			0.0131	6.18E-01	5.61E+00	8.34E-01	6.86E-02	0.00E+00	0.00E+00	1.41E-01	2.10E-01	6.37E+01	1.0
Zinc	9.61	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA	8.39E+01	4.62E+02	1.32E+02	9.32E+00	0.00E+00	0.00E+00	3.80E-01	9.70E+00	1.71E+02	1.0
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	1.31	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49	5.17E+00	1.07E+04	9.59E+03	5.73E-01	0.00E+00	0.00E+00	7.47E-01	1.32E+00	3.37E+02	1.0
Benzo(b)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	25	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03	1.55E+02	1.06E+05	1.02E+05	1.72E+01	0.00E+00	0.00E+00	8.04E+00	2.52E+01	3.62E+03	1.0
Indeno(1,2,3-cd)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	50	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94	2.92E+02	2.29E+05	2.58E+05	3.24E+01	0.00E+00	0.00E+00	1.79E+01	5.04E+01	8.08E+03	1.0
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA = not available

Exposure factors for calculations

IRf	*0.111*	*kg/kg BW/day*
Psoil	*0.02*	
Pplant	*1*	
Pinvert	*0*	
Psm	*0*	

286

Attachment 4
Calculation of ESLs for Inorganic ECOIs and Other Organic ECOIs with Regression-Based Bioaccumulation Factors
Receptor - Deer Mouse (Herbivore)

		Uptake Factor Models												Estimated Concentrations			Intake						
ECOI	**TRV(Threshold)**	**Plant Model**	**B0**	**B1**	**BAF**	**Invertebrate Model**	**B0**	**B1**	**BAF**	**Small Mammal Model**	**B0**	**B1**	**BAF**	**Plant**	**Invertebrate**	**Small Mammal**	**Plant**	**Invertebrate**	**Small Mammal**	**Soil**	**Total**	**SSL Threshold**	**Target HQ**
Aluminum	NA	BAF			0.005	BAF			0.118	BAF			0.093									NA	NA
Antimony	0.19	ln(Cp) = B0 + B1(lnCs)	-3.233	0.937	NA	BAF			1	BAF			0.003	1.04E+00	3.28E+01	9.84E-02	1.15E-01	0.00E+00	0.00E+00	7.28E-02	1.88E-01	3.28E+01	1.0
Arsenic	1.23	BAF			1.103	ln(Ce) = B0 +B1(lnCs)	-1.421	0.706	NA	lnCm = B0 + B1(lnCs)	-4.5796	0.7354	NA	1.09E+01	1.22E+00	5.52E-02	1.21E+00	0.00E+00	0.00E+00	2.19E-02	1.23E+00	9.87E+00	1.0
Barium	NA	BAF			0.477	BAF			0.16	BAF			0.1121									NA	NA
Beryllium	0.58	BAF			0.01	BAF			1.18	BAF			0.003	1.74E+00	2.06E+02	5.23E-01	1.93E-01	0.00E+00	0.00E+00	3.87E-01	5.80E-01	1.74E+02	1.0
Boron	NA	BAF			4	BAF			1	BAF			0.01									NA	NA
Cadmium	0.84	ln(Cp) = B0 + B1(lnCs)	-0.476	0.546	NA	ln(Ce) = B0 +B1(lnCs)	2.114	0.795	NA	lnCm = B0 + B1(lnCs)	-1.5383	0.566	NA	6.26E+00	2.39E+02	2.36E+00	6.95E-01	0.00E+00	0.00E+00	1.53E-01	8.48E-01	6.88E+01	1.0
Chromium III	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA									NA	NA
Chromium VI	NA	BAF			0.084	BAF			3.162	lnCm = B0 + B1(lnCs)	-1.4945	0.7326	NA									NA	NA
Cobalt	8.94	BAF			0.0248	BAF			0.291	BAF			0.1	4.41E+01	5.18E+02	1.78E+02	4.90E+00	0.00E+00	0.00E+00	3.95E+00	8.85E+00	1.78E+03	1.0
Copper	NA	ln(Cp) = B0 + B1(lnCs)	0.669	0.394	NA	ln(Ce) = B0 +B1(lnCs)	1.675	0.264	NA	lnCm = B0 + B1(lnCs)	2.042	0.1444	NA									NA	NA
Cyanide	NA	BAF			1	BAF			1	BAF			1									NA	NA
Fluoride	NA	BAF			1	BAF			1	BAF			0.362									NA	NA
Iron	NA	BAF			0.01	BAF			0.078	lnCm = B0 + B1(lnCs)	-0.2879	0.5969	NA									NA	NA
Lead	4.85	ln(Cp) = B0 + B1(lnCs)	-1.328	0.561	NA	ln(Ce) = B0 +B1(lnCs)	-0.218	0.807	NA	lnCm = B0 + B1(lnCs)	0.0761	0.4422	NA	1.54E+01	2.77E+02	2.65E+01	1.71E+00	0.00E+00	0.00E+00	3.09E+00	4.80E+00	1.39E+03	1.0
Lithium	NA	BAF			0.025	BAF			0.217	BAF			0.006									NA	NA
Manganese	46.69	BAF			0.234	ln(Ce) = B0 +B1(lnCs)	-0.809	0.682	NA	BAF			0.037	3.91E+02	7.03E+01	6.19E+01	4.34E+01	0.00E+00	0.00E+00	3.71E+00	4.72E+01	1.67E+03	1.0
Mercury	NA	ln(Cp) = B0 + B1(lnCs)	-0.996	0.544	NA	ln(Ce) = B0 +B1(lnCs)	-0.684	0.118	NA	BAF			0.192									NA	NA
Molybdenum	NA	BAF			0.25	BAF			2.09	BAF			0.035									NA	NA
Nickel	NA	ln(Cp) = B0 + B1(lnCs)	-2.224	0.748	NA	BAF			4.73	lnCm = B0 + B1(lnCs)	-0.2462	0.4658	NA									NA	NA
Nitrate	NA	BAF			1	BAF			1	BAF			1									NA	NA
PCB	0.51	BAF			0.25	ln(Ce) = B0 +B1(lnCs)	1.41	1.361	NA	BAF			28.79	4.25E+00	1.94E+02	4.90E+02	4.72E-01	0.00E+00	0.00E+00	3.78E-02	5.10E-01	1.70E+01	1.0
Selenium	NA	ln(Cp) = B0 + B1(lnCs)	-0.678	1.104	NA	ln(Ce) = B0 +B1(lnCs)	-0.075	0.733	NA	lnCm = B0 + B1(lnCs)	-0.4158	0.3764	NA									NA	NA
Silver	NA	BAF			0.0367	BAF			15.3	BAF			0.81									NA	NA
Strontium	NA	BAF			2.5	BAF			0.278	BAF			0.002									NA	NA
TCDD (Dioxin)	NA	BAF			0.22	ln(Ce) = B0 +B1(lnCs)	3.533	1.182	NA	lnCm = B0 + B1(lnCs)	0.8113	1.0993	NA									NA	NA
Thallium	0.83	BAF			0.004	BAF			1	BAF			0.123	1.25E+00	3.12E+02	3.83E+01	1.38E-01	0.00E+00	0.00E+00	6.92E-01	8.30E-01	3.12E+02	1.0
Tin	NA	BAF			0.03	BAF			1	BAF			0.21									NA	NA
Titanium	NA	BAF			0.0055	BAF			1	BAF			0.075									NA	NA
Uranium	NA	BAF			0.0085	BAF			0.063	BAF			0.00004									NA	NA
Vanadium	NA	BAF			0.0097	BAF			0.088	BAF			0.0131									NA	NA
Zinc	NA	ln(Cp) = B0 + B1(lnCs)	1.575	0.555	NA	ln(Ce) = B0 +B1(lnCs)	4.449	0.328	NA	lnCm = B0 + B1(lnCs)	4.4987	0.0745	NA									NA	NA
Anthracene	NA	ln(Cp) = B0 + B1(lnCs)	0.079	0.867	NA	BAF			29.8	BAF			30.95									NA	NA
Benzo(a)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			31.2	BAF			28.7									NA	NA
Benzo(a)pyrene	6.55	ln(Cp) = B0 + B1(lnCs)	-2.053	0.635	NA	BAF			31.9	BAF			28.49	1.66E+01	6.78E+04	6.05E+04	1.85E+00	0.00E+00	0.00E+00	4.72E+00	6.56E+00	2.12E+03	1.0
Benzo(b)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32	BAF			28.75									NA	NA
Benzo(ghi)perylene	NA	ln(Cp) = B0 + B1(lnCs)	-2.565	1.299	NA	BAF			32.6	BAF			29.55									NA	NA
Benzo(k)fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.3	BAF			28.68									NA	NA
Chrysene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			25.6	BAF			28.54									NA	NA
Dibenz(a,h)anthracene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.61									NA	NA
Fluoranthene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			33.69									NA	NA
Fluorene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.4	BAF			28.03									NA	NA
Indeno(1,2,3-cd)pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			32.6	BAF			28.54									NA	NA
Napthalene	86.6	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			28.4	BAF			31.94	4.79E+02	4.30E+05	4.83E+05	5.32E+01	0.00E+00	0.00E+00	3.36E+01	8.68E+01	1.51E+04	1.0
Phenanthrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			29.8	BAF			35.48									NA	NA
Pyrene	NA	ln(Cp) = B0 + B1(lnCs)	-1.44	0.791	NA	BAF			30.4	BAF			31.54									NA	NA

NA= not available
Exposure factors for calculations

IRf	*0.111*	*kg/kg BW/day*
Psoil	*0.02*	
Pplant	*1*	
Pinvert	*0*	
Psm	*0*	

287

Attachment Table 5
ESL Calculations for Organic ECOIs

			Dietary Proportion				Bioconcentration Factors			Toxicity Reference Values		Ecological Screening Level	
ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Vegetation	Invertebrate	Small Mammal	Soil in Diet	Soil to Plant	Soil to Invertebrate	Soil to Small Mammal	NOAEL (mg/kg day)	Threshold (mg/kg day)	NOAEL (mg/kg)	Threshold (mg/kg)
Carbon Tetrachloride	American Kestrel	0.092	0	0.2	0.8	0.05	6.72E-01	2.76E+01	2.84E+01	NA	NA	NA	NA
Chlordane	American Kestrel	0.092	0	0.2	0.8	0.05	2.58E-01	3.21E+01	2.86E+01	2.14E+00	4.79E+00	7.93E-01	1.77E+00
Chlorobenzene	American Kestrel	0.092	0	0.2	0.8	0.05	6.40E-01	2.78E+01	2.84E+01	NA	NA	NA	NA
Chloroform	American Kestrel	0.092	0	0.2	0.8	0.05	8.47E-01	2.66E+01	2.84E+01	NA	NA	NA	NA
cis-1,2-dichloroethene	American Kestrel	0.092	0	0.2	0.8	0.05	7.55E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
DDD	American Kestrel	0.092	0	0.2	0.8	0.05	8.00E-02	3.16E+01	2.83E+01	NA	NA	NA	NA
DDE	American Kestrel	0.092	0	0.2	0.8	0.05	6.20E-01	3.27E+01	2.90E+01	6.00E-02	NA	2.19E-02	NA
DDE	American Kestrel	0.092	0	0.2	0.8	0.05	6.20E-01	3.27E+01	2.90E+01	NA	NA	NA	NA
DDT	American Kestrel	0.092	0	0.2	0.8	0.05	8.00E-02	3.24E+01	2.85E+01	9.00E-03	NA	3.34E-03	NA
Dibenzofuran	American Kestrel	0.092	0	0.2	0.8	0.05	4.89E-01	2.90E+01	2.84E+01	NA	NA	NA	NA
Dibromochloromethane	American Kestrel	0.092	0	0.2	0.8	0.05	8.09E-01	2.68E+01	2.84E+01	NA	NA	NA	NA
Dicamba	American Kestrel	0.092	0	0.2	0.8	0.05	7.25E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
Dichlorodifluoromethane	American Kestrel	0.092	0	0.2	0.8	0.05	7.85E-01	2.70E+01	2.84E+01	NA	NA	NA	NA
Dieldrin	American Kestrel	0.092	0	0.2	0.8	0.05	1.64E+00	3.12E+01	2.97E+01	7.10E-02	NA	2.57E-02	NA
Diethyl Ether	American Kestrel	0.092	0	0.2	0.8	0.05	9.52E-01	2.62E+01	2.85E+01	NA	NA	NA	NA
Diethylphthalate	American Kestrel	0.092	0	0.2	0.8	0.05	6.38E-01	2.78E+01	2.84E+01	NA	NA	NA	NA
Dimethoate	American Kestrel	0.092	0	0.2	0.8	0.05	1.15E+00	2.54E+01	2.86E+01	8.00E-02	NA	3.10E-02	NA
Dimethylphthalate	American Kestrel	0.092	0	0.2	0.8	0.05	8.17E-01	2.68E+01	2.84E+01	NA	NA	NA	NA
Di-n-butyl phthalate	American Kestrel	0.092	0	0.2	0.8	0.05	3.91E-01	3.01E+01	2.84E+01	1.10E-01	NA	4.15E-02	NA
Di-n-octylphthalate	American Kestrel	0.092	0	0.2	0.8	0.05	1.46E-01	3.51E+01	2.88E+01	NA	NA	NA	NA
Endosulfan	American Kestrel	0.092	0	0.2	0.8	0.05	5.16E-01	2.88E+01	2.84E+01	1.00E+01	NA	3.81E+00	NA
Endrin	American Kestrel	0.092	0	0.2	0.8	0.05	3.17E-01	3.11E+01	2.85E+01	1.00E-02	NA	3.74E-03	NA
Ethyl acetate	American Kestrel	0.092	0	0.2	0.8	0.05	9.13E-01	2.63E+01	2.85E+01	NA	NA	NA	NA
Ethylbenzene	American Kestrel	0.092	0	0.2	0.8	0.05	5.80E-01	2.83E+01	2.84E+01	NA	NA	NA	NA
Fluoranthene	American Kestrel	0.092	0	0.2	0.8	0.05	6.03E+00	3.04E+01	3.37E+01	NA	NA	NA	NA
Fluorene	American Kestrel	0.092	0	0.2	0.8	0.05	6.00E-02	2.94E+01	2.80E+01	NA	NA	NA	NA
Fluoride	American Kestrel	0.092	0	0.2	0.8	0.05	1.17E+00	2.53E+01	2.86E+01	7.80E+00	NA	3.03E+00	NA
Heptachlor	American Kestrel	0.092	0	0.2	0.8	0.05	2.86E-01	3.16E+01	2.85E+01	NA	NA	NA	NA
Heptachlor epoxide	American Kestrel	0.092	0	0.2	0.8	0.05	3.96E-01	3.00E+01	2.84E+01	NA	NA	NA	NA
Hexachlorobenzene	American Kestrel	0.092	0	0.2	0.8	0.05	2.86E-01	3.16E+01	2.85E+01	5.63E-02	NA	2.10E-02	NA
Hexachlorobutadiene	American Kestrel	0.092	0	0.2	0.8	0.05	3.80E-01	3.02E+01	2.84E+01	3.00E+00	NA	1.13E+00	NA
Hexachlorocyclopentadiene	American Kestrel	0.092	0	0.2	0.8	0.05	3.89E-01	3.01E+01	2.84E+01	NA	NA	NA	NA
Hexachloroethane	American Kestrel	0.092	0	0.2	0.8	0.05	4.52E-01	2.94E+01	2.84E+01	NA	NA	NA	NA
Isophorone	American Kestrel	0.092	0	0.2	0.8	0.05	6.43E-01	2.78E+01	2.84E+01	NA	NA	NA	NA
Isopropylbenzene	American Kestrel	0.092	0	0.2	0.8	0.05	5.22E-01	2.87E+01	2.84E+01	NA	NA	NA	NA
Lindane	American Kestrel	0.092	0	0.2	0.8	0.05	4.26E-01	2.97E+01	2.84E+01	2.00E+00	NA	7.57E-01	NA
Methoxychlor	American Kestrel	0.092	0	0.2	0.8	0.05	3.00E-01	3.13E+01	2.85E+01	NA	NA	NA	NA
Methyl Ethyl Ketone	American Kestrel	0.092	0	0.2	0.8	0.05	1.16E+00	2.54E+01	2.86E+01	NA	NA	NA	NA
Methyl Methacrylate	American Kestrel	0.092	0	0.2	0.8	0.05	8.99E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Methylene Chloride	American Kestrel	0.092	0	0.2	0.8	0.05	8.86E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Methyl-tertbutyl ether	American Kestrel	0.092	0	0.2	0.8	0.05	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Napthalene	American Kestrel	0.092	0	0.2	0.8	0.05	4.19E+00	2.84E+01	3.19E+01	NA	NA	NA	NA
n-Nitrosodiphenylamine	American Kestrel	0.092	0	0.2	0.8	0.05	8.53E-01	2.66E+01	2.85E+01	NA	NA	NA	NA
n-Nitrosodipropylamine	American Kestrel	0.092	0	0.2	0.8	0.05	8.88E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	American Kestrel	0.092	0	0.2	0.8	0.05	1.01E+00	2.59E+01	2.85E+01	NA	NA	NA	NA
Pendimethalin	American Kestrel	0.092	0	0.2	0.8	0.05	3.71E-01	3.03E+01	2.84E+01	NA	NA	NA	NA
Pentachlorobenzene	American Kestrel	0.092	0	0.2	0.8	0.05	3.52E-01	3.06E+01	2.85E+01	NA	NA	NA	NA
Pentachloronitrobenzene	American Kestrel	0.092	0	0.2	0.8	0.05	3.52E-01	3.06E+01	2.85E+01	7.07E+00	NA	2.66E+00	NA
Pentachloronitrobenzene	American Kestrel	0.092	0	0.2	0.8	0.05	3.52E-01	3.06E+01	2.85E+01	NA	NA	NA	NA
Pentachlorophenol	American Kestrel	0.092	0	0.2	0.8	0.05	3.73E-01	3.03E+01	2.84E+01	NA	NA	NA	NA
Phenol	American Kestrel	0.092	0	0.2	0.8	0.05	8.49E-01	2.66E+01	2.85E+01	NA	NA	NA	NA
p-Nitrotoluene	American Kestrel	0.092	0	0.2	0.8	0.05	6.86E-01	2.75E+01	2.84E+01	NA	NA	NA	NA
Pyrene	American Kestrel	0.092	0	0.2	0.8	0.05	3.70E+00	3.04E+01	3.15E+01	NA	NA	NA	NA
Styrene	American Kestrel	0.092	0	0.2	0.8	0.05	6.01E-01	2.81E+01	2.84E+01	NA	NA	NA	NA
Sulfotep	American Kestrel	0.092	0	0.2	0.8	0.05	4.57E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
Toluene	American Kestrel	0.092	0	0.2	0.8	0.05	6.56E-01	2.77E+01	2.84E+01	NA	NA	NA	NA
Toxaphene	American Kestrel	0.092	0	0.2	0.8	0.05	2.26E-01	3.27E+01	2.86E+01	NA	NA	NA	NA
trans-1,2-dichloroethene	American Kestrel	0.092	0	0.2	0.8	0.05	7.55E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
Trichloroethene	American Kestrel	0.092	0	0.2	0.8	0.05	6.67E-01	2.77E+01	2.84E+01	NA	NA	NA	NA
Trichlorofluoromethane	American Kestrel	0.092	0	0.2	0.8	0.05	7.19E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
Trifluralin	American Kestrel	0.092	0	0.2	0.8	0.05	3.28E-01	3.09E+01	2.85E+01	NA	NA	NA	NA

Attachment Table 5
ESL Calculations for Organic ECOIs

ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Dietary Proportion: Vegetation	Dietary Proportion: Invertebrate	Dietary Proportion: Small Mammal	Dietary Proportion: Soil in Diet	Bioconcentration Factors: Soil to Plant	Bioconcentration Factors: Soil to Invertebrate	Bioconcentration Factors: Soil to Small Mammal	Toxicity Reference Values: NOAEL (mg/kg day)	Toxicity Reference Values: Threshold (mg/kg day)	Ecological Screening Level: NOAEL (mg/kg)	Ecological Screening Level: Threshold (mg/kg)
1,1,1-Trichloroethane	American Kestrel	0.092	0	0.2	0.8	0.05	6.33E-01	2.79E+01	2.84E+01	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	American Kestrel	0.092	0	0.2	0.8	0.05	7.15E-01	2.74E+01	2.84E+01	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	American Kestrel	0.092	0	0.2	0.8	0.05	7.15E-01	2.74E+01	2.84E+01	NA	NA	NA	NA
1,1,2-Trichloroethane	American Kestrel	0.092	0	0.2	0.8	0.05	7.49E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
1,1-Dichloroethane	American Kestrel	0.092	0	0.2	0.8	0.05	7.97E-01	2.69E+01	2.84E+01	NA	NA	NA	NA
1,1-Dichloroethene	American Kestrel	0.092	0	0.2	0.8	0.05	7.29E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
1,2,3-Trichloropropane	American Kestrel	0.092	0	0.2	0.8	0.05	6.62E-01	2.77E+01	2.84E+01	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	American Kestrel	0.092	0	0.2	0.8	0.05	3.95E-01	3.00E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trichlorobenzene	American Kestrel	0.092	0	0.2	0.8	0.05	4.63E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trimethylbenzene	American Kestrel	0.092	0	0.2	0.8	0.05	4.99E-01	2.89E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	American Kestrel	0.092	0	0.2	0.8	0.05	5.45E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichloroethane	American Kestrel	0.092	0	0.2	0.8	0.05	7.83E-01	2.70E+01	2.84E+01	1.72E+01	NA	6.63E+00	NA
1,2-Dichloroethene	American Kestrel	0.092	0	0.2	0.8	0.05	7.55E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichloropropane	American Kestrel	0.092	0	0.2	0.8	0.05	7.05E-01	2.74E+01	2.84E+01	NA	NA	NA	NA
1,3,5-Trimethylbenzene	American Kestrel	0.092	0	0.2	0.8	0.05	4.99E-01	2.89E+01	2.84E+01	NA	NA	NA	NA
1,3-Dichloropropene	American Kestrel	0.092	0	0.2	0.8	0.05	6.98E-01	2.75E+01	2.84E+01	NA	NA	NA	NA
1,3-Isobenzofurnadione	American Kestrel	0.092	0	0.2	0.8	0.05	7.38E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
1,4 Dioxane	American Kestrel	0.092	0	0.2	0.8	0.05	1.34E+00	2.48E+01	2.88E+01	NA	NA	NA	NA
1,4-Dichlorobenzene (-p)	American Kestrel	0.092	0	0.2	0.8	0.05	5.45E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
1-Methyl napthalene	American Kestrel	0.092	0	0.2	0.8	0.05	4.88E-01	2.90E+01	2.84E+01	NA	NA	NA	NA
2,3,4,6 Tetrachlorophenol	American Kestrel	0.092	0	0.2	0.8	0.05	4.45E-01	2.95E+01	2.84E+01	NA	NA	NA	NA
2,4,5-Trichlorophenol	American Kestrel	0.092	0	0.2	0.8	0.05	5.22E-01	2.87E+01	2.84E+01	NA	NA	NA.	NA
2,4,5-Trichlorophenoxy Acetic Acid	American Kestrel	0.092	0	0.2	0.8	0.05	5.48E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
2,4,6-Trichlorophenol	American Kestrel	0.092	0	0.2	0.8	0.05	5.22E-01	2.87E+01	2.84E+01	NA	NA	NA	NA
2,4,6-Trinitrotoluene	American Kestrel	0.092	0	0.2	0.8	0.05	7.53E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
2,4-Dichlorophenol	American Kestrel	0.092	0	0.2	0.8	0.05	6.15E-01	2.80E+01	2.84E+01	NA	NA	NA	NA
2,4-Dinitrophenol	American Kestrel	0.092	0	0.2	0.8	0.05	8.03E-01	2.69E+01	2.84E+01	NA	NA	NA	NA
2,4-Dinitrotoluene	American Kestrel	0.092	0	0.2	0.8	0.05	7.18E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
2,6-Dinitrotoluene	American Kestrel	0.092	0	0.2	0.8	0.05	7.18E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
2-Chloronaphthalene	American Kestrel	0.092	0	0.2	0.8	0.05	4.77E-01	2.91E+01	2.84E+01	NA	NA	NA	NA
2-Chlorophenol	American Kestrel	0.092	0	0.2	0.8	0.05	7.21E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
2-Methylnaphthalene	American Kestrel	0.092	0	0.2	0.8	0.05	4.88E-01	2.90E+01	2.84E+01	NA	NA	NA	NA
2-Methylphenol	American Kestrel	0.092	0	0.2	0.8	0.05	7.40E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
2-Nitroaniline	American Kestrel	0.092	0	0.2	0.8	0.05	7.47E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
3,3-Dichlorobenzidine	American Kestrel	0.092	0	0.2	0.8	0.05	5.55E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
4-(2,4-Dichlorophenoxy) Butyric Acid	American Kestrel	0.092	0	0.2	0.8	0.05	5.03E-01	2.89E+01	2.84E+01	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	American Kestrel	0.092	0	0.2	0.8	0.05	7.02E-01	2.74E+01	2.84E+01	NA	NA	NA	NA
4-Chloroaniline	American Kestrel	0.092	0	0.2	0.8	0.05	8.05E-01	2.69E+01	2.84E+01	NA	NA	NA	NA
4-Methyl-2-Pentanone	American Kestrel	0.092	0	0.2	0.8	0.05	9.26E-01	2.63E+01	2.85E+01	NA	NA	NA	NA
4-Nitroanoline	American Kestrel	0.092	0	0.2	0.8	0.05	8.57E-01	2.66E+01	2.85E+01	NA	NA	NA	NA
4-Nitrophenol	American Kestrel	0.092	0	0.2	0.8	0.05	7.68E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
Acenaphthene	American Kestrel	0.092	0	0.2	0.8	0.05	4.38E-01	2.95E+01	2.84E+01	NA	NA	NA	NA
Acetone	American Kestrel	0.092	0	0.2	0.8	0.05	1.32E+00	2.49E+01	2.87E+01	NA	NA	NA	NA
Aldrin	American Kestrel	0.092	0	0.2	0.8	0.05	2.29E-01	3.27E+01	2.86E+01	NA	NA	NA	NA
alpha-BHC	American Kestrel	0.092	0	0.2	0.8	0.05	4.26E-01	2.97E+01	2.84E+01	NA	NA	NA	NA
Ammonium (as Ammonia)	American Kestrel	0.092	0	0.2	0.8	0.05	1.17E+00	2.53E+01	2.86E+01	NA	NA	NA	NA
Anthracene	American Kestrel	0.092	0	0.2	0.8	0.05	3.10E+00	2.98E+01	3.09E+01	NA	NA	NA	NA
Benzene	American Kestrel	0.092	0	0.2	0.8	0.05	7.53E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
Benzo(a)pyrene	American Kestrel	0.092	0	0.2	0.8	0.05	2.00E-01	3.19E+01	2.85E+01	NA	NA	NA	NA
Benzyl alcohol	American Kestrel	0.092	0	0.2	0.8	0.05	9.45E-01	2.62E+01	2.85E+01	NA	NA	NA	NA
Beta-BHC	American Kestrel	0.092	0	0.2	0.8	0.05	4.26E-01	2.97E+01	2.84E+01	NA	NA	NA	NA
BHC (Mixed)	American Kestrel	0.092	0	0.2	0.8	0.05	4.26E-01	2.97E+01	2.84E+01	5.60E-01	NA	2.12E-01	NA
bis(2-chloroethyl)ether	American Kestrel	0.092	0	0.2	0.8	0.05	8.38E-01	2.67E+01	2.84E+01	NA	NA	NA	NA
bis(2-chloroisopropyl)ether	American Kestrel	0.092	0	0.2	0.8	0.05	6.81E-01	2.76E+01	2.84E+01	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	American Kestrel	0.092	0	0.2	0.8	0.05	1.52E-01	3.49E+01	2.88E+01	1.10E+00	NA	3.98E-01	NA
Bromodichloromethane	American Kestrel	0.092	0	0.2	0.8	0.05	8.28E-01	2.67E+01	2.84E+01	NA	NA	NA	NA
Bromoform	American Kestrel	0.092	0	0.2	0.8	0.05	7.91E-01	2.69E+01	2.84E+01	NA	NA	NA	NA
Bromomethane (methyl bromide)	American Kestrel	0.092	0	0.2	0.8	0.05	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Butylbenzylphthalate	American Kestrel	0.092	0	0.2	0.8	0.05	4.04E-01	2.99E+01	2.84E+01	NA	NA	NA	NA
Carbazole	American Kestrel	0.092	0	0.2	0.8	0.05	5.52E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
Carbon disulfide	American Kestrel	0.092	0	0.2	0.8	0.05	7.62E-01	2.71E+01	2.84E+01	NA	NA	NA	NA

290

Attachment Table 5
ESL Calculations for Organic ECOIs

ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Dietary Proportion: Vegetation	Dietary Proportion: Invertebrate	Dietary Proportion: Small Mammal	Dietary Proportion: Soil in Diet	Bioconcentration Factors: Soil to Plant	Bioconcentration Factors: Soil to Invertebrate	Bioconcentration Factors: Soil to Small Mammal	Toxicity Reference Values: NOAEL (mg/kg day)	Toxicity Reference Values: Threshold (mg/kg day)	Ecological Screening Level: NOAEL (mg/kg)	Ecological Screening Level: Threshold (mg/kg)
Vinyl acetate	American Kestrel	0.092	0	0.2	0.8	0.05	1.03E+00	2.58E+01	2.85E+01	NA	NA	NA	NA
Vinyl Chloride	American Kestrel	0.092	0	0.2	0.8	0.05	8.26E-01	2.67E+01	2.84E+01	NA	NA	NA	NA
Xylene (Mixed)	American Kestrel	0.092	0	0.2	0.8	0.05	5.72E-01	2.83E+01	2.84E+01	NA	NA	NA	NA
1,1,1-Trichloroethane	Coyote - Carnivore	0.015	0	0	1	0.028	6.33E-01	2.79E+01	2.84E+01	1.00E+03	NA	2.35E+03	NA
1,1,2,2-Tetrachloroethane	Coyote - Carnivore	0.015	0	0	1	0.028	7.15E-01	2.74E+01	2.84E+01	1.08E+02	NA	2.53E+02	NA
1,1,2-Trichloroethane	Coyote - Carnivore	0.015	0	0	1	0.028	7.49E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
1,1-Dichloroethane	Coyote - Carnivore	0.015	0	0	1	0.028	7.97E-01	2.69E+01	2.84E+01	5.46E+00	NA	1.28E+01	NA
1,1-Dichloroethene	Coyote - Carnivore	0.015	0	0	1	0.028	7.29E-01	2.73E+01	2.84E+01	3.00E+01	NA	7.03E+01	NA
1,2,3-Trichloropropane	Coyote - Carnivore	0.015	0	0	1	0.028	6.62E-01	2.77E+01	2.84E+01	2.50E+01	NA	5.86E+01	NA
1,2,4,5-Tetrachlorobenzene	Coyote - Carnivore	0.015	0	0	1	0.028	3.95E-01	3.00E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trichlorobenzene	Coyote - Carnivore	0.015	0	0	1	0.028	4.63E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trimethylbenzene	Coyote - Carnivore	0.015	0	0	1	0.028	4.99E-01	2.89E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	Coyote - Carnivore	0.015	0	0	1	0.028	5.45E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichloroethane	Coyote - Carnivore	0.015	0	0	1	0.028	7.83E-01	2.70E+01	2.84E+01	5.00E+01	NA	1.17E+02	NA
1,2-Dichloroethene	Coyote - Carnivore	0.015	0	0	1	0.028	7.55E-01	2.71E+01	2.84E+01	4.52E+01	NA	1.06E+02	NA
1,2-Dichloropropane	Coyote - Carnivore	0.015	0	0	1	0.028	7.05E-01	2.74E+01	2.84E+01	8.90E+01	1.26E+02	2.09E+02	2.96E+02
1,3,5-Trimethylbenzene	Coyote - Carnivore	0.015	0	0	1	0.028	4.99E-01	2.89E+01	2.84E+01	1.43E+01	NA	3.35E+01	NA
1,3-Dichloropropene	Coyote - Carnivore	0.015	0	0	1	0.028	6.98E-01	2.75E+01	2.84E+01	5.00E+00	8.66E+00	1.17E+01	2.03E+01
1,3-Isobenzofurnadione	Coyote - Carnivore	0.015	0	0	1	0.028	7.38E-01	2.72E+01	2.84E+01	7.57E+02	NA	1.78E+03	NA
1,4 Dioxane	Coyote - Carnivore	0.015	0	0	1	0.028	1.34E+00	2.48E+01	2.88E+01	2.96E+01	NA	6.85E+01	NA
1,4-Dichlorobenzene (-p)	Coyote - Carnivore	0.015	0	0	1	0.028	5.45E-01	2.85E+01	2.84E+01	1.07E+02	1.51E+02	2.51E+02	3.55E+02
1-Methyl napthalene	Coyote - Carnivore	0.015	0	0	1	0.028	4.88E-01	2.90E+01	2.84E+01	1.40E+01	NA	3.28E+01	NA
2,3,4,6 Tetrachlorophenol	Coyote - Carnivore	0.015	0	0	1	0.028	4.45E-01	2.95E+01	2.84E+01	1.00E+01	NA	2.34E+01	NA
2,4,5-Trichlorophenol	Coyote - Carnivore	0.015	0	0	1	0.028	5.22E-01	2.87E+01	2.84E+01	1.00E+01	1.73E+01	2.35E+01	4.06E+01
2,4,5-Trichlorophenoxy Acetic Acid	Coyote - Carnivore	0.015	0	0	1	0.028	5.48E-01	2.85E+01	2.84E+01	3.00E-01	5.50E-01	7.04E-01	1.29E+00
2,4,6-Trichlorophenol	Coyote - Carnivore	0.015	0	0	1	0.028	5.22E-01	2.87E+01	2.84E+01	3.00E-01	NA	7.04E-01	NA
2,4,6-Trinitrotoluene	Coyote - Carnivore	0.015	0	0	1	0.028	7.53E-01	2.71E+01	2.84E+01	5.00E-01	1.18E+00	1.17E+00	2.77E+00
2,4-Dichlorophenol	Coyote - Carnivore	0.015	0	0	1	0.028	6.15E-01	2.80E+01	2.84E+01	5.00E+00	NA	1.17E+01	NA
2,4-Dinitrophenol	Coyote - Carnivore	0.015	0	0	1	0.028	8.03E-01	2.69E+01	2.84E+01	1.25E+02	2.09E+02	2.93E+02	4.90E+02
2,4-Dinitrotoluene	Coyote - Carnivore	0.015	0	0	1	0.028	7.18E-01	2.73E+01	2.84E+01	5.70E-02	NA	1.34E-01	NA
2,6-Dinitrotoluene	Coyote - Carnivore	0.015	0	0	1	0.028	7.18E-01	2.73E+01	2.84E+01	1.10E+01	1.96E+01	2.58E+01	4.60E+01
2-Chloronaphthalene	Coyote - Carnivore	0.015	0	0	1	0.028	4.77E-01	2.91E+01	2.84E+01	NA	NA	NA	NA
2-Chlorophenol	Coyote - Carnivore	0.015	0	0	1	0.028	7.21E-01	2.73E+01	2.84E+01	5.00E-01	NA	1.17E+00	NA
2-Methylnaphthalene	Coyote - Carnivore	0.015	0	0	1	0.028	4.88E-01	2.90E+01	2.84E+01	5.23E+00	7.61E+00	1.23E+01	1.78E+01
2-Methylphenol	Coyote - Carnivore	0.015	0	0	1	0.028	7.40E-01	2.72E+01	2.84E+01	2.19E+02	NA	5.14E+02	NA
2-Nitroaniline	Coyote - Carnivore	0.015	0	0	1	0.028	7.47E-01	2.72E+01	2.84E+01	1.00E+01	NA	2.34E+01	NA
3,3-Dichlorobenzidine	Coyote - Carnivore	0.015	0	0	1	0.028	5.55E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
4-(2,4-Dichlorophenoxy) Butyric Acid	Coyote - Carnivore	0.015	0	0	1	0.028	5.03E-01	2.89E+01	2.84E+01	8.00E-01	NA	1.88E+00	NA
4,6-Dinitro-2-methylphenol	Coyote - Carnivore	0.015	0	0	1	0.028	7.02E-01	2.74E+01	2.84E+01	1.00E+00	NA	2.35E+00	NA
4-Chloroaniline	Coyote - Carnivore	0.015	0	0	1	0.028	8.05E-01	2.69E+01	2.84E+01	1.25E+00	NA	2.93E+00	NA
4-Methyl-2-Pentanone	Coyote - Carnivore	0.015	0	0	1	0.028	9.26E-01	2.63E+01	2.85E+01	2.50E+01	NA	5.84E+01	NA
4-Nitroanoline	Coyote - Carnivore	0.015	0	0	1	0.028	8.57E-01	2.66E+01	2.85E+01	7.10E+01	NA	1.66E+02	NA
4-Nitrophenol	Coyote - Carnivore	0.015	0	0	1	0.028	7.68E-01	2.71E+01	2.84E+01	2.50E+01	NA	5.86E+01	NA
Acenaphthene	Coyote - Carnivore	0.015	0	0	1	0.028	4.38E-01	2.95E+01	2.84E+01	NA	NA	NA	NA
Acetone	Coyote - Carnivore	0.015	0	0	1	0.028	1.32E+00	2.49E+01	2.87E+01	1.00E+01	2.24E+01	2.32E+01	5.18E+01
Aldrin	Coyote - Carnivore	0.015	0	0	1	0.028	2.29E-01	3.27E+01	2.86E+01	1.00E-01	NA	2.33E-01	NA
alpha-BHC	Coyote - Carnivore	0.015	0	0	1	0.028	4.26E-01	2.97E+01	2.84E+01	3.60E+01	NA	8.44E+01	NA
Ammonium (as Ammonia)	Coyote - Carnivore	0.015	0	0	1	0.028	1.17E+00	2.53E+01	2.86E+01	9.66E+02	NA	2.25E+03	NA
Anthracene	Coyote - Carnivore	0.015	0	0	1	0.028	3.10E+00	2.98E+01	3.09E+01	NA	NA	NA	NA
Benzene	Coyote - Carnivore	0.015	0	0	1	0.028	7.53E-01	2.71E+01	2.84E+01	2.64E+01	NA	6.18E+01	NA
Benzo(a)pyrene	Coyote - Carnivore	0.015	0	0	1	0.028	2.00E-01	3.19E+01	2.85E+01	1.31E+00	6.55E+00	3.06E+00	1.53E+01
Benzyl alcohol	Coyote - Carnivore	0.015	0	0	1	0.028	9.45E-01	2.62E+01	2.85E+01	7.50E+00	NA	1.75E+01	NA
Beta-BHC	Coyote - Carnivore	0.015	0	0	1	0.028	4.26E-01	2.97E+01	2.84E+01	4.00E-01	8.94E-01	9.38E-01	2.10E+00
BHC (Mixed)	Coyote - Carnivore	0.015	0	0	1	0.028	4.26E-01	2.97E+01	2.84E+01	1.60E+00	2.26E+00	3.75E+00	5.30E+00
bis(2-chloroethyl)ether	Coyote - Carnivore	0.015	0	0	1	0.028	8.38E-01	2.67E+01	2.84E+01	NA	NA	NA	NA
bis(2-chloroisopropyl)ether	Coyote - Carnivore	0.015	0	0	1	0.028	6.81E-01	2.76E+01	2.84E+01	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	Coyote - Carnivore	0.015	0	0	1	0.028	1.52E-01	3.49E+01	2.88E+01	1.83E+01	NA	4.23E+01	NA
Bromodichloromethane	Coyote - Carnivore	0.015	0	0	1	0.028	8.28E-01	2.67E+01	2.84E+01	1.00E+01	1.41E+01	2.34E+01	3.30E+01
Bromoform	Coyote - Carnivore	0.015	0	0	1	0.028	7.91E-01	2.69E+01	2.84E+01	5.00E+00	NA	1.17E+01	NA
Bromomethane (methyl bromide)	Coyote - Carnivore	0.015	0	0	1	0.028	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Butylbenzylphthalate	Coyote - Carnivore	0.015	0	0	1	0.028	4.04E-01	2.99E+01	2.84E+01	4.70E+01	8.16E+01	1.10E+02	1.91E+02

Attachment Table 5
ESL Calculations for Organic ECOIs

			Dietary Proportion				Bioconcentration Factors			Toxicity Reference Values		Ecological Screening Level	
ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Vegetation	Invertebrate	Small Mammal	Soil in Diet	Soil to Plant	Soil to Invertebrate	Soil to Small Mammal	NOAEL (mg/kg day)	Threshold (mg/kg day)	NOAEL (mg/kg)	Threshold (mg/kg)
Carbazole	Coyote - Carnivore	0.015	0	0	1	0.028	5.52E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
Carbon disulfide	Coyote - Carnivore	0.015	0	0	1	0.028	7.62E-01	2.71E+01	2.84E+01	1.00E+01	NA	2.34E+01	NA
Carbon Tetrachloride	Coyote - Carnivore	0.015	0	0	1	0.028	6.72E-01	2.76E+01	2.84E+01	1.60E+01	NA	3.75E+01	NA
Chlordane	Coyote - Carnivore	0.015	0	0	1	0.028	2.58E-01	3.21E+01	2.86E+01	4.60E+00	NA	1.07E+01	NA
Chlorobenzene	Coyote - Carnivore	0.015	0	0	1	0.028	6.40E-01	2.78E+01	2.84E+01	8.60E+00	1.22E+01	2.02E+01	2.86E+01
Chloroform	Coyote - Carnivore	0.015	0	0	1	0.028	8.47E-01	2.66E+01	2.84E+01	1.50E+01	2.48E+01	3.51E+01	5.81E+01
cis-1,2-dichloroethene	Coyote - Carnivore	0.015	0	0	1	0.028	7.55E-01	2.71E+01	2.84E+01	3.20E+00	NA	7.50E+00	NA
DDD	Coyote - Carnivore	0.015	0	0	1	0.028	8.00E-02	3.16E+01	2.83E+01	2.82E+01	NA	6.63E+01	NA
DDE	Coyote - Carnivore	0.015	0	0	1	0.028	6.20E-01	3.27E+01	2.90E+01	1.10E+00	NA	2.53E+00	NA
DDT	Coyote - Carnivore	0.015	0	0	1	0.028	8.00E-02	3.24E+01	2.85E+01	8.00E-01	3.58E+00	1.87E+00	8.38E+00
Dibenzofuran	Coyote - Carnivore	0.015	0	0	1	0.028	4.89E-01	2.90E+01	2.84E+01	4.00E+01	NA	NA	9.38E+01
Dibromochloromethane	Coyote - Carnivore	0.015	0	0	1	0.028	8.09E-01	2.68E+01	2.84E+01	1.00E+01	NA	2.34E+01	NA
Dicamba	Coyote - Carnivore	0.015	0	0	1	0.028	7.25E-01	2.73E+01	2.84E+01	3.00E+00	NA	7.03E+00	NA
Dichlorodifluoromethane	Coyote - Carnivore	0.015	0	0	1	0.028	7.85E-01	2.70E+01	2.84E+01	1.50E+00	NA	3.51E+00	NA
Dieldrin	Coyote - Carnivore	0.015	0	0	1	0.028	1.64E+00	3.12E+01	2.97E+01	1.50E-02	2.12E-02	3.36E-02	4.76E-02
Diethyl Ether	Coyote - Carnivore	0.015	0	0	1	0.028	9.52E-01	2.62E+01	2.85E+01	5.00E+01	NA	1.17E+02	NA
Diethylphthalate	Coyote - Carnivore	0.015	0	0	1	0.028	6.38E-01	2.78E+01	2.84E+01	4.58E+03	NA	1.08E+04	NA
Dimethoate	Coyote - Carnivore	0.015	0	0	1	0.028	1.15E+00	2.54E+01	2.86E+01	NA	NA	NA	NA
Dimethylphthalate	Coyote - Carnivore	0.015	0	0	1	0.028	8.17E-01	2.68E+01	2.84E+01	3.50E+02	NA	8.20E+02	NA
Di-n-butyl phthalate	Coyote - Carnivore	0.015	0	0	1	0.028	3.91E-01	3.01E+01	2.84E+01	5.50E+02	NA	1.29E+03	NA
Di-n-octylphthalate	Coyote - Carnivore	0.015	0	0	1	0.028	1.46E-01	3.51E+01	2.88E+01	1.67E+03	3.54E+03	3.85E+03	8.17E+03
Endosulfan	Coyote - Carnivore	0.015	0	0	1	0.028	5.16E-01	2.88E+01	2.84E+01	1.50E-01	NA	3.52E-01	NA
Endrin	Coyote - Carnivore	0.015	0	0	1	0.028	3.17E-01	3.11E+01	2.85E+01	9.20E-02	NA	2.15E-01	NA
Ethyl acetate	Coyote - Carnivore	0.015	0	0	1	0.028	9.13E-01	2.63E+01	2.85E+01	9.00E+01	NA	2.10E+02	NA
Ethylbenzene	Coyote - Carnivore	0.015	0	0	1	0.028	5.80E-01	2.83E+01	2.84E+01	9.70E+00	NA	2.28E+01	NA
Fluoranthene	Coyote - Carnivore	0.015	0	0	1	0.028	6.03E+00	3.04E+01	3.37E+01	NA	NA	NA	NA
Fluorene	Coyote - Carnivore	0.015	0	0	1	0.028	6.00E-02	2.94E+01	2.80E+01	2.50E+01	NA	5.94E+01	NA
Fluoride	Coyote - Carnivore	0.015	0	0	1	0.028	1.17E+00	2.53E+01	2.86E+01	3.14E+01	NA	7.30E+01	NA
Heptachlor	Coyote - Carnivore	0.015	0	0	1	0.028	2.86E-01	3.16E+01	2.85E+01	1.30E-01	9.40E-01	3.04E-01	2.20E+00
Heptachlor epoxide	Coyote - Carnivore	0.015	0	0	1	0.028	3.96E-01	3.00E+01	2.84E+01	1.25E-01	NA	2.93E-01	NA
Hexachlorobenzene	Coyote - Carnivore	0.015	0	0	1	0.028	2.86E-01	3.16E+01	2.85E+01	2.00E+00	NA	4.67E+00	NA
Hexachlorobutadiene	Coyote - Carnivore	0.015	0	0	1	0.028	3.80E-01	3.02E+01	2.84E+01	2.00E+00	NA	4.68E+00	NA
Hexachlorocyclopentadiene	Coyote - Carnivore	0.015	0	0	1	0.028	3.89E-01	3.01E+01	2.84E+01	1.08E+01	NA	2.53E+01	NA
Hexachloroethane	Coyote - Carnivore	0.015	0	0	1	0.028	4.52E-01	2.94E+01	2.84E+01	7.00E-01	9.90E-01	1.64E+00	2.32E+00
Isophorone	Coyote - Carnivore	0.015	0	0	1	0.028	6.43E-01	2.78E+01	2.84E+01	NA	NA	NA	NA
Isopropylbenzene	Coyote - Carnivore	0.015	0	0	1	0.028	5.22E-01	2.87E+01	2.84E+01	NA	NA	NA	NA
Lindane	Coyote - Carnivore	0.015	0	0	1	0.028	4.26E-01	2.97E+01	2.84E+01	5.00E-02	NA	1.17E-01	NA
Methoxychlor	Coyote - Carnivore	0.015	0	0	1	0.028	3.00E-01	3.13E+01	2.85E+01	2.50E+00	NA	5.84E+00	NA
Methyl Ethyl Ketone	Coyote - Carnivore	0.015	0	0	1	0.028	1.16E+00	2.54E+01	2.86E+01	1.77E+03	NA	4.12E+03	NA
Methyl Methacrylate	Coyote - Carnivore	0.015	0	0	1	0.028	8.99E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Methylene Chloride	Coyote - Carnivore	0.015	0	0	1	0.028	8.86E-01	2.65E+01	2.85E+01	5.85E+00	1.71E+01	1.37E+01	4.00E+01
Methyl-tertbutyl ether	Coyote - Carnivore	0.015	0	0	1	0.028	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Napthalene	Coyote - Carnivore	0.015	0	0	1	0.028	4.19E+00	2.84E+01	3.19E+01	5.00E+01	8.66E+01	1.04E+02	1.81E+02
n-Nitrosodiphenylamine	Coyote - Carnivore	0.015	0	0	1	0.028	8.53E-01	2.66E+01	2.85E+01	5.80E+01	1.16E+02	1.36E+02	2.72E+02
n-Nitrosodipropylamine	Coyote - Carnivore	0.015	0	0	1	0.028	8.88E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	Coyote - Carnivore	0.015	0	0	1	0.028	1.01E+00	2.59E+01	2.85E+01	2.70E+01	NA	6.30E+01	NA
Pendimethalin	Coyote - Carnivore	0.015	0	0	1	0.028	3.71E-01	3.03E+01	2.84E+01	2.50E+00	NA	5.85E+00	NA
Pentachlorobenzene	Coyote - Carnivore	0.015	0	0	1	0.028	3.52E-01	3.06E+01	2.85E+01	8.50E-01	NA	1.99E+00	NA
Pentachloronitrobenzene	Coyote - Carnivore	0.015	0	0	1	0.028	3.52E-01	3.06E+01	2.85E+01	NA	NA	NA	NA
Pentachloronitrobenzene	Coyote - Carnivore	0.015	0	0	1	0.028	3.52E-01	3.06E+01	2.85E+01	2.00E+02	NA	4.68E+02	NA
Pentachlorophenol	Coyote - Carnivore	0.015	0	0	1	0.028	3.73E-01	3.03E+01	2.84E+01	2.40E-01	7.60E-01	5.62E-01	1.78E+00
Phenol	Coyote - Carnivore	0.015	0	0	1	0.028	8.49E-01	2.66E+01	2.85E+01	4.00E+01	NA	9.36E+01	NA
p-Nitrotoluene	Coyote - Carnivore	0.015	0	0	1	0.028	6.86E-01	2.75E+01	2.84E+01	1.10E+02	1.17E+02	2.58E+02	2.75E+02
Pyrene	Coyote - Carnivore	0.015	0	0	1	0.028	3.70E+00	3.04E+01	3.15E+01	NA	NA	NA	NA
Styrene	Coyote - Carnivore	0.015	0	0	1	0.028	6.01E-01	2.81E+01	2.84E+01	3.00E+01	3.46E+01	7.04E+01	8.12E+01
Sulfotep	Coyote - Carnivore	0.015	0	0	1	0.028	4.57E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
Toluene	Coyote - Carnivore	0.015	0	0	1	0.028	6.56E-01	2.77E+01	2.84E+01	2.60E+01	NA	6.10E+01	NA
Toxaphene	Coyote - Carnivore	0.015	0	0	1	0.028	2.26E-01	3.27E+01	2.86E+01	8.00E+00	NA	1.86E+01	NA
trans-1,2-dichloroethene	Coyote - Carnivore	0.015	0	0	1	0.028	7.55E-01	2.71E+01	2.84E+01	4.52E+01	NA	1.06E+02	NA
Trichloroethene	Coyote - Carnivore	0.015	0	0	1	0.028	6.67E-01	2.77E+01	2.84E+01	7.00E-01	NA	1.64E+00	NA
Trichlorofluoromethane	Coyote - Carnivore	0.015	0	0	1	0.028	7.19E-01	2.73E+01	2.84E+01	NA	NA	NA	NA

292

Attachment Table 5
ESL Calculations for Organic ECOIs

ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Dietary Proportion				Bioconcentration Factors			Toxicity Reference Values		Ecological Screening Level	
			Vegetation	Invertebrate	Small Mammal	Soil in Diet	Soil to Plant	Soil to Invertebrate	Soil to Small Mammal	NOAEL (mg/kg day)	Threshold (mg/kg day)	NOAEL (mg/kg)	Threshold (mg/kg)
Trifluralin	Coyote - Carnivore	0.015	0	0	1	0.028	3.28E-01	3.09E+01	2.85E+01	3.25E+00	NA	7.60E+00	NA
Vinyl acetate	Coyote - Carnivore	0.015	0	0	1	0.028	1.03E+00	2.58E+01	2.85E+01	2.35E+01	NA	5.48E+01	NA
Vinyl Chloride	Coyote - Carnivore	0.015	0	0	1	0.028	8.26E-01	2.67E+01	2.84E+01	1.70E-01	NA	3.98E-01	NA
Xylene (Mixed)	Coyote - Carnivore	0.015	0	0	1	0.028	5.72E-01	2.83E+01	2.84E+01	2.10E+00	2.34E+00	4.93E+00	5.48E+00
1,1,1-Trichloroethane	Coyote - Generalist	0.015	0	0.25	0.75	0.05	6.33E-01	2.79E+01	2.84E+01	1.00E+03	NA	2.35E+03	NA
1,1,2,2-Tetrachloroethane	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.15E-01	2.74E+01	2.84E+01	1.08E+02	NA	2.55E+02	NA
1,1,2-Trichloroethane	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.49E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
1,1-Dichloroethane	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.97E-01	2.69E+01	2.84E+01	5.46E+00	NA	1.30E+01	NA
1,1-Dichloroethene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.29E-01	2.73E+01	2.84E+01	3.00E+01	NA	7.10E+01	NA
1,2,3-Trichloropropane	Coyote - Generalist	0.015	0	0.25	0.75	0.05	6.62E-01	2.77E+01	2.84E+01	2.50E+01	NA	5.90E+01	NA
1,2,4,5-Tetrachlorobenzene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	3.95E-01	3.00E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trichlorobenzene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	4.63E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trimethylbenzene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	4.99E-01	2.89E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	Coyote - Generalist	0.015	0	0.25	0.75	0.05	5.45E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichloroethane	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.83E-01	2.70E+01	2.84E+01	5.00E+01	NA	1.19E+02	NA
1,2-Dichloroethene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.55E-01	2.71E+01	2.84E+01	4.52E+01	NA	1.07E+02	NA
1,2-Dichloropropane	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.05E-01	2.74E+01	2.84E+01	8.90E+01	1.26E+02	2.10E+02	2.98E+02
1,3,5-Trimethylbenzene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	4.99E-01	2.89E+01	2.84E+01	1.43E+01	NA	3.34E+01	NA
1,3-Dichloropropene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	6.98E-01	2.75E+01	2.84E+01	5.00E+00	8.66E+00	1.18E+01	2.05E+01
1,3-Isobenzofurnadione	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.38E-01	2.72E+01	2.84E+01	7.57E+02	NA	1.79E+03	NA
1,4 Dioxane	Coyote - Generalist	0.015	0	0.25	0.75	0.05	1.34E+00	2.48E+01	2.88E+01	2.96E+01	NA	7.09E+01	NA
1,4-Dichlorobenzene (-p)	Coyote - Generalist	0.015	0	0.25	0.75	0.05	5.45E-01	2.85E+01	2.84E+01	1.07E+02	1.51E+02	2.51E+02	3.54E+02
1-Methyl napthalene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	4.88E-01	2.90E+01	2.84E+01	1.40E+01	NA	3.26E+01	NA
2,3,4,6 Tetrachlorophenol	Coyote - Generalist	0.015	0	0.25	0.75	0.05	4.45E-01	2.95E+01	2.84E+01	1.00E+01	NA	2.32E+01	NA
2,4,5-Trichlorophenol	Coyote - Generalist	0.015	0	0.25	0.75	0.05	5.22E-01	2.87E+01	2.84E+01	1.00E+01	1.73E+01	2.34E+01	4.04E+01
2,4,5-Trichlorophenoxy Acetic Acid	Coyote - Generalist	0.015	0	0.25	0.75	0.05	5.48E-01	2.85E+01	2.84E+01	3.00E-01	5.50E-01	7.03E-01	1.29E+00
2,4,6-Trichlorophenol	Coyote - Generalist	0.015	0	0.25	0.75	0.05	5.22E-01	2.87E+01	2.84E+01	3.00E-01	NA	7.01E-01	NA
2,4,6-Trinitrotoluene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.53E-01	2.71E+01	2.84E+01	5.00E-01	1.18E+00	1.18E+00	2.80E+00
2,4-Dichlorophenol	Coyote - Generalist	0.015	0	0.25	0.75	0.05	6.15E-01	2.80E+01	2.84E+01	5.00E+00	NA	1.18E+01	NA
2,4-Dinitrophenol	Coyote - Generalist	0.015	0	0.25	0.75	0.05	8.03E-01	2.69E+01	2.84E+01	1.25E+02	2.09E+02	2.97E+02	4.96E+02
2,4-Dinitrotoluene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.18E-01	2.73E+01	2.84E+01	5.70E-02	NA	1.35E-01	NA
2,6-Dinitrotoluene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.18E-01	2.73E+01	2.84E+01	1.10E+01	1.96E+01	2.60E+01	4.64E+01
2-Chloronaphthalene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	4.77E-01	2.91E+01	2.84E+01	NA	NA	NA	NA
2-Chlorophenol	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.21E-01	2.73E+01	2.84E+01	5.00E-01	NA	1.18E+00	NA
2-Methylnaphthalene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	4.88E-01	2.90E+01	2.84E+01	5.23E+00	7.61E+00	1.22E+01	1.77E+01
2-Methylphenol	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.40E-01	2.72E+01	2.84E+01	2.19E+02	NA	5.19E+02	NA
2-Nitroaniline	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.47E-01	2.72E+01	2.84E+01	1.00E+01	NA	2.37E+01	NA
3,3-Dichlorobenzidine	Coyote - Generalist	0.015	0	0.25	0.75	0.05	5.55E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
4-(2,4-Dichlorophenoxy) Butyric Acid	Coyote - Generalist	0.015	0	0.25	0.75	0.05	5.03E-01	2.89E+01	2.84E+01	8.00E-01	NA	1.87E+00	NA
4,6-Dinitro-2-methylphenol	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.02E-01	2.74E+01	2.84E+01	1.00E+00	NA	2.36E+00	NA
4-Chloroaniline	Coyote - Generalist	0.015	0	0.25	0.75	0.05	8.05E-01	2.69E+01	2.84E+01	1.25E+00	NA	2.97E+00	NA
4-Methyl-2-Pentanone	Coyote - Generalist	0.015	0	0.25	0.75	0.05	9.26E-01	2.63E+01	2.85E+01	2.50E+01	NA	5.96E+01	NA
4-Nitroaniline	Coyote - Generalist	0.015	0	0.25	0.75	0.05	8.57E-01	2.66E+01	2.85E+01	7.10E+01	NA	1.69E+02	NA
4-Nitrophenol	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.68E-01	2.71E+01	2.84E+01	2.50E+01	NA	5.93E+01	NA
Acenaphthene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	4.38E-01	2.95E+01	2.84E+01	NA	NA	NA	NA
Acetone	Coyote - Generalist	0.015	0	0.25	0.75	0.05	1.32E+00	2.49E+01	2.87E+01	1.00E+01	2.24E+01	2.40E+01	5.36E+01
Aldrin	Coyote - Generalist	0.015	0	0.25	0.75	0.05	2.29E-01	3.27E+01	2.86E+01	1.00E-01	NA	2.25E-01	NA
alpha-BHC	Coyote - Generalist	0.015	0	0.25	0.75	0.05	4.26E-01	2.97E+01	2.84E+01	3.60E+01	NA	8.34E+01	NA
Ammonium (as Ammonia)	Coyote - Generalist	0.015	0	0.25	0.75	0.05	1.17E+00	2.53E+01	2.86E+01	9.66E+02	NA	2.31E+03	NA
Anthracene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	3.10E+00	2.98E+01	3.09E+01	NA	NA	NA	NA
Benzene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.53E-01	2.71E+01	2.84E+01	2.64E+01	NA	6.24E+01	NA
Benzo(a)pyrene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	2.00E-01	3.19E+01	2.85E+01	1.31E+00	6.55E+00	2.97E+00	1.49E+01
Benzyl alcohol	Coyote - Generalist	0.015	0	0.25	0.75	0.05	9.45E-01	2.62E+01	2.85E+01	7.50E+00	NA	1.79E+01	NA
Beta-BHC	Coyote - Generalist	0.015	0	0.25	0.75	0.05	4.26E-01	2.97E+01	2.84E+01	4.00E-01	8.94E-01	9.27E-01	2.07E+00
BHC (Mixed)	Coyote - Generalist	0.015	0	0.25	0.75	0.05	4.26E-01	2.97E+01	2.84E+01	1.60E+00	2.26E+00	3.71E+00	5.24E+00
bis(2-chloroethyl)ether	Coyote - Generalist	0.015	0	0.25	0.75	0.05	8.38E-01	2.67E+01	2.84E+01	NA	NA	NA	NA
bis(2-chloroisopropyl)ether	Coyote - Generalist	0.015	0	0.25	0.75	0.05	6.81E-01	2.76E+01	2.84E+01	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	Coyote - Generalist	0.015	0	0.25	0.75	0.05	1.52E-01	3.49E+01	2.88E+01	1.83E+01	NA	4.02E+01	NA
Bromodichloromethane	Coyote - Generalist	0.015	0	0.25	0.75	0.05	8.28E-01	2.67E+01	2.84E+01	1.00E+01	1.41E+01	2.38E+01	3.35E+01
Bromoform	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.91E-01	2.69E+01	2.84E+01	5.00E+00	NA	1.19E+01	NA
Bromomethane (methyl bromide)	Coyote - Generalist	0.015	0	0.25	0.75	0.05	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA

293

Attachment Table 5

ESL Calculations for Organic ECOIs

			Dietary Proportion				Bioconcentration Factors			Toxicity Reference Values		Ecological Screening Level	
ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Vegetation	Invertebrate	Small Mammal	Soil in Diet	Soil to Plant	Soil to Invertebrate	Soil to Small Mammal	NOAEL (mg/kg day)	Threshold (mg/kg day)	NOAEL (mg/kg)	Threshold (mg/kg)
Butylbenzylphthalate	Coyote - Generalist	0.015	0	0.25	0.75	0.05	4.04E-01	2.99E+01	2.84E+01	4.70E+01	8.16E+01	1.09E+02	1.89E+02
Carbazole	Coyote - Generalist	0.015	0	0.25	0.75	0.05	5.52E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
Carbon disulfide	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.62E-01	2.71E+01	2.84E+01	1.00E+01	NA	2.37E+01	NA
Carbon Tetrachloride	Coyote - Generalist	0.015	0	0.25	0.75	0.05	6.72E-01	2.76E+01	2.84E+01	1.60E+01	NA	3.78E+01	NA
Chlordane	Coyote - Generalist	0.015	0	0.25	0.75	0.05	2.58E-01	3.21E+01	2.86E+01	4.60E+00	NA	1.04E+01	NA
Chlorobenzene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	6.40E-01	2.78E+01	2.84E+01	8.60E+00	1.22E+01	2.03E+01	2.87E+01
Chloroform	Coyote - Generalist	0.015	0	0.25	0.75	0.05	8.47E-01	2.66E+01	2.84E+01	1.50E+01	2.48E+01	3.57E+01	5.89E+01
cis-1,2-dichloroethene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.55E-01	2.71E+01	2.84E+01	3.20E+00	NA	7.58E+00	NA
DDD	Coyote - Generalist	0.015	0	0.25	0.75	0.05	8.00E-02	3.16E+01	2.83E+01	2.82E+01	NA	6.44E+01	NA
DDE	Coyote - Generalist	0.015	0	0.25	0.75	0.05	6.20E-01	3.27E+01	2.90E+01	1.10E+00	NA	2.45E+00	NA
DDT	Coyote - Generalist	0.015	0	0.25	0.75	0.05	8.00E-02	3.24E+01	2.85E+01	8.00E-01	3.58E+00	1.81E+00	8.09E+00
Dibenzofuran	Coyote - Generalist	0.015	0	0.25	0.75	0.05	4.89E-01	2.90E+01	2.84E+01	4.00E+01	NA	NA	9.32E+01
Dibromochloromethane	Coyote - Generalist	0.015	0	0.25	0.75	0.05	8.09E-01	2.68E+01	2.84E+01	1.00E+01	NA	2.37E+01	NA
Dicamba	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.25E-01	2.73E+01	2.84E+01	3.00E+00	NA	7.10E+00	NA
Dichlorodifluoromethane	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.85E-01	2.70E+01	2.84E+01	1.50E+00	NA	3.56E+00	NA
Dieldrin	Coyote - Generalist	0.015	0	0.25	0.75	0.05	1.64E+00	3.12E+01	2.97E+01	1.50E-02	2.12E-02	3.32E-02	4.69E-02
Diethyl Ether	Coyote - Generalist	0.015	0	0.25	0.75	0.05	9.52E-01	2.62E+01	2.85E+01	5.00E+01	NA	1.19E+02	NA
Diethylphthalate	Coyote - Generalist	0.015	0	0.25	0.75	0.05	6.38E-01	2.78E+01	2.84E+01	4.58E+03	NA	1.08E+04	NA
Dimethoate	Coyote - Generalist	0.015	0	0.25	0.75	0.05	1.15E+00	2.54E+01	2.86E+01	NA	NA	NA	NA
Dimethylphthalate	Coyote - Generalist	0.015	0	0.25	0.75	0.05	8.17E-01	2.68E+01	2.84E+01	3.50E+02	NA	8.31E+02	NA
Di-n-butyl phthalate	Coyote - Generalist	0.015	0	0.25	0.75	0.05	3.91E-01	3.01E+01	2.84E+01	5.50E+02	NA	1.27E+03	NA
Di-n-octylphthalate	Coyote - Generalist	0.015	0	0.25	0.75	0.05	1.46E-01	3.51E+01	2.88E+01	1.67E+03	3.54E+03	3.65E+03	7.75E+03
Endosulfan	Coyote - Generalist	0.015	0	0.25	0.75	0.05	5.16E-01	2.88E+01	2.84E+01	1.50E-01	NA	3.50E-01	NA
Endrin	Coyote - Generalist	0.015	0	0.25	0.75	0.05	3.17E-01	3.11E+01	2.85E+01	9.20E-02	NA	2.10E-01	NA
Ethyl acetate	Coyote - Generalist	0.015	0	0.25	0.75	0.05	9.13E-01	2.63E+01	2.85E+01	9.00E+01	NA	2.14E+02	NA
Ethylbenzene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	5.80E-01	2.83E+01	2.84E+01	9.70E+00	NA	2.28E+01	NA
Fluoranthene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	6.03E+00	3.04E+01	3.37E+01	NA	NA	NA	NA
Fluorene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	6.00E-02	2.94E+01	2.80E+01	2.50E+01	NA	5.86E+01	NA
Fluoride	Coyote - Generalist	0.015	0	0.25	0.75	0.05	1.17E+00	2.53E+01	2.86E+01	3.14E+01	NA	7.51E+01	NA
Heptachlor	Coyote - Generalist	0.015	0	0.25	0.75	0.05	2.86E-01	3.16E+01	2.85E+01	1.30E-01	9.40E-01	2.95E-01	2.14E+00
Heptachlor epoxide	Coyote - Generalist	0.015	0	0.25	0.75	0.05	3.96E-01	3.00E+01	2.84E+01	1.25E-01	NA	2.89E-01	NA
Hexachlorobenzene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	2.86E-01	3.16E+01	2.85E+01	2.00E+00	NA	4.54E+00	NA
Hexachlorobutadiene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	3.80E-01	3.02E+01	2.84E+01	2.00E+00	NA	4.61E+00	NA
Hexachlorocyclopentadiene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	3.89E-01	3.01E+01	2.84E+01	1.08E+01	NA	2.49E+01	NA
Hexachloroethane	Coyote - Generalist	0.015	0	0.25	0.75	0.05	4.52E-01	2.94E+01	2.84E+01	7.00E-01	9.90E-01	1.63E+00	2.30E+00
Isophorone	Coyote - Generalist	0.015	0	0.25	0.75	0.05	6.43E-01	2.78E+01	2.84E+01	NA	NA	NA	NA
Isopropylbenzene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	5.22E-01	2.87E+01	2.84E+01	NA	NA	NA	NA
Lindane	Coyote - Generalist	0.015	0	0.25	0.75	0.05	4.26E-01	2.97E+01	2.84E+01	5.00E-02	NA	1.16E-01	NA
Methoxychlor	Coyote - Generalist	0.015	0	0.25	0.75	0.05	3.00E-01	3.13E+01	2.85E+01	2.50E+00	NA	5.69E+00	NA
Methyl Ethyl Ketone	Coyote - Generalist	0.015	0	0.25	0.75	0.05	1.16E+00	2.54E+01	2.86E+01	1.77E+03	NA	4.24E+03	NA
Methyl Methacrylate	Coyote - Generalist	0.015	0	0.25	0.75	0.05	8.99E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Methylene Chloride	Coyote - Generalist	0.015	0	0.25	0.75	0.05	8.86E-01	2.65E+01	2.85E+01	5.85E+00	1.71E+01	1.39E+01	4.07E+01
Methyl-tertbutyl ether	Coyote - Generalist	0.015	0	0.25	0.75	0.05	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Napthalene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	4.19E+00	2.84E+01	3.19E+01	5.00E+01	8.66E+01	1.07E+02	1.86E+02
n-Nitrosodiphenylamine	Coyote - Generalist	0.015	0	0.25	0.75	0.05	8.53E-01	2.66E+01	2.85E+01	5.80E+01	1.16E+02	1.38E+02	2.76E+02
n-Nitrosodipropylamine	Coyote - Generalist	0.015	0	0.25	0.75	0.05	8.88E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	Coyote - Generalist	0.015	0	0.25	0.75	0.05	1.01E+00	2.59E+01	2.85E+01	2.70E+01	NA	6.44E+01	NA
Pendimethalin	Coyote - Generalist	0.015	0	0.25	0.75	0.05	3.71E-01	3.03E+01	2.84E+01	2.50E+00	NA	5.75E+00	NA
Pentachlorobenzene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	3.52E-01	3.06E+01	2.85E+01	8.50E-01	NA	1.95E+00	NA
Pentachloronitrobenzene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	3.52E-01	3.06E+01	2.85E+01	NA	NA	NA	NA
Pentachloronitrobenzene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	3.52E-01	3.06E+01	2.85E+01	2.00E+02	NA	4.59E+02	NA
Pentachlorophenol	Coyote - Generalist	0.015	0	0.25	0.75	0.05	3.73E-01	3.03E+01	2.84E+01	2.40E-01	7.60E-01	5.53E-01	1.75E+00
Phenol	Coyote - Generalist	0.015	0	0.25	0.75	0.05	8.49E-01	2.66E+01	2.85E+01	4.00E+01	NA	9.51E+01	NA
p-Nitrotoluene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	6.86E-01	2.75E+01	2.84E+01	1.10E+02	1.17E+02	2.60E+02	2.77E+02
Pyrene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	3.70E+00	3.04E+01	3.15E+01	NA	NA	NA	NA
Styrene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	6.01E-01	2.81E+01	2.84E+01	3.00E+01	3.46E+01	7.05E+01	8.13E+01
Sulfotep	Coyote - Generalist	0.015	0	0.25	0.75	0.05	4.57E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
Toluene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	6.56E-01	2.77E+01	2.84E+01	2.60E+01	NA	6.13E+01	NA
Toxaphene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	2.26E-01	3.27E+01	2.86E+01	8.00E+00	NA	1.80E+01	NA
trans-1,2-dichloroethene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.55E-01	2.71E+01	2.84E+01	4.52E+01	NA	1.07E+02	NA
Trichloroethene	Coyote - Generalist	0.015	0	0.25	0.75	0.05	6.67E-01	2.77E+01	2.84E+01	7.00E-01	NA	1.65E+00	NA

294

Attachment Table 5
ESL Calculations for Organic ECOIs

ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Dietary Proportion: Vegetation	Dietary Proportion: Invertebrate	Dietary Proportion: Small Mammal	Soil in Diet	Bioconcentration Factors: Soil to Plant	Bioconcentration Factors: Soil to Invertebrate	Bioconcentration Factors: Soil to Small Mammal	Toxicity Reference Values: NOAEL (mg/kg day)	Toxicity Reference Values: Threshold (mg/kg day)	Ecological Screening Level: NOAEL (mg/kg)	Ecological Screening Level: Threshold (mg/kg)
Trichlorofluoromethane	Coyote - Generalist	0.015	0	0.25	0.75	0.05	7.19E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
Trifluralin	Coyote - Generalist	0.015	0	0.25	0.75	0.05	3.28E-01	3.09E+01	2.85E+01	3.25E+00	NA	7.44E+00	NA
Vinyl acetate	Coyote - Generalist	0.015	0	0.25	0.75	0.05	1.03E+00	2.58E+01	2.85E+01	2.35E+01	NA	5.61E+01	NA
Vinyl Chloride	Coyote - Generalist	0.015	0	0.25	0.75	0.05	8.26E-01	2.67E+01	2.84E+01	1.70E-01	NA	4.04E-01	NA
Xylene (Mixed)	Coyote - Generalist	0.015	0	0.25	0.75	0.05	5.72E-01	2.83E+01	2.84E+01	2.10E+00	2.34E+00	4.93E+00	5.48E+00
1,1,1-Trichloroethane	Coyote - Insectivore	0.015	0	1	0	0.028	6.33E-01	2.79E+01	2.84E+01	1.00E+03	NA	2.39E+03	NA
1,1,2,2-Tetrachloroethane	Coyote - Insectivore	0.015	0	1	0	0.028	7.15E-01	2.74E+01	2.84E+01	1.08E+02	NA	2.63E+02	NA
1,1,2-Trichloroethane	Coyote - Insectivore	0.015	0	1	0	0.028	7.49E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
1,1-Dichloroethane	Coyote - Insectivore	0.015	0	1	0	0.028	7.97E-01	2.69E+01	2.84E+01	5.46E+00	NA	1.35E+01	NA
1,1-Dichloroethene	Coyote - Insectivore	0.015	0	1	0	0.028	7.29E-01	2.73E+01	2.84E+01	3.00E+01	NA	7.33E+01	NA
1,2,3-Trichloropropane	Coyote - Insectivore	0.015	0	1	0	0.028	6.62E-01	2.77E+01	2.84E+01	2.50E+01	NA	6.01E+01	NA
1,2,4,5-Tetrachlorobenzene	Coyote - Insectivore	0.015	0	1	0	0.028	3.95E-01	3.00E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trichlorobenzene	Coyote - Insectivore	0.015	0	1	0	0.028	4.63E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trimethylbenzene	Coyote - Insectivore	0.015	0	1	0	0.028	4.99E-01	2.89E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	Coyote - Insectivore	0.015	0	1	0	0.028	5.45E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichloroethane	Coyote - Insectivore	0.015	0	1	0	0.028	7.83E-01	2.70E+01	2.84E+01	5.00E+01	NA	1.23E+02	NA
1,2-Dichloroethene	Coyote - Insectivore	0.015	0	1	0	0.028	7.55E-01	2.71E+01	2.84E+01	4.52E+01	NA	1.11E+02	NA
1,2-Dichloropropane	Coyote - Insectivore	0.015	0	1	0	0.028	7.05E-01	2.74E+01	2.84E+01	8.90E+01	1.26E+02	2.16E+02	3.07E+02
1,3,5-Trimethylbenzene	Coyote - Insectivore	0.015	0	1	0	0.028	4.99E-01	2.89E+01	2.84E+01	1.43E+01	NA	3.29E+01	NA
1,3-Dichloropropene	Coyote - Insectivore	0.015	0	1	0	0.028	6.98E-01	2.75E+01	2.84E+01	5.00E+00	8.66E+00	1.21E+01	2.10E+01
1,3-Isobenzofurnadione	Coyote - Insectivore	0.015	0	1	0	0.028	7.38E-01	2.72E+01	2.84E+01	7.57E+02	NA	1.85E+03	NA
1,4 Dioxane	Coyote - Insectivore	0.015	0	1	0	0.028	1.34E+00	2.48E+01	2.88E+01	2.96E+01	NA	7.95E+01	NA
1,4-Dichlorobenzene (-p)	Coyote - Insectivore	0.015	0	1	0	0.028	5.45E-01	2.85E+01	2.84E+01	1.07E+02	1.51E+02	2.50E+02	3.53E+02
1-Methyl napthalene	Coyote - Insectivore	0.015	0	1	0	0.028	4.88E-01	2.90E+01	2.84E+01	1.40E+01	NA	3.21E+01	NA
2,3,4,6 Tetrachlorophenol	Coyote - Insectivore	0.015	0	1	0	0.028	4.45E-01	2.95E+01	2.84E+01	1.00E+01	NA	2.26E+01	NA
2,4,5-Trichlorophenol	Coyote - Insectivore	0.015	0	1	0	0.028	5.22E-01	2.87E+01	2.84E+01	1.00E+01	1.73E+01	2.32E+01	4.01E+01
2,4,5-Trichlorophenoxy Acetic Acid	Coyote - Insectivore	0.015	0	1	0	0.028	5.48E-01	2.85E+01	2.84E+01	3.00E-01	5.50E-01	7.01E-01	1.28E+00
2,4,6-Trichlorophenol	Coyote - Insectivore	0.015	0	1	0	0.028	5.22E-01	2.87E+01	2.84E+01	3.00E-01	NA	6.95E-01	NA
2,4,6-Trinitrotoluene	Coyote - Insectivore	0.015	0	1	0	0.028	7.53E-01	2.71E+01	2.84E+01	5.00E-01	1.18E+00	1.23E+00	2.90E+00
2,4-Dichlorophenol	Coyote - Insectivore	0.015	0	1	0	0.028	6.15E-01	2.80E+01	2.84E+01	5.00E+00	NA	1.19E+01	NA
2,4-Dinitrophenol	Coyote - Insectivore	0.015	0	1	0	0.028	8.03E-01	2.69E+01	2.84E+01	1.25E+02	2.09E+02	3.10E+02	5.19E+02
2,4-Dinitrotoluene	Coyote - Insectivore	0.015	0	1	0	0.028	7.18E-01	2.73E+01	2.84E+01	5.70E-02	NA	1.39E-01	NA
2,6-Dinitrotoluene	Coyote - Insectivore	0.015	0	1	0	0.028	7.18E-01	2.73E+01	2.84E+01	1.10E+01	1.96E+01	2.68E+01	4.78E+01
2-Chloronaphthalene	Coyote - Insectivore	0.015	0	1	0	0.028	4.77E-01	2.91E+01	2.84E+01	NA	NA	NA	NA
2-Chlorophenol	Coyote - Insectivore	0.015	0	1	0	0.028	7.21E-01	2.73E+01	2.84E+01	5.00E-01	NA	1.22E+00	NA
2-Methylnaphthalene	Coyote - Insectivore	0.015	0	1	0	0.028	4.88E-01	2.90E+01	2.84E+01	5.23E+00	7.61E+00	1.20E+01	1.75E+01
2-Methylphenol	Coyote - Insectivore	0.015	0	1	0	0.028	7.40E-01	2.72E+01	2.84E+01	2.19E+02	NA	5.36E+02	NA
2-Nitroaniline	Coyote - Insectivore	0.015	0	1	0	0.028	7.47E-01	2.72E+01	2.84E+01	1.00E+01	NA	2.45E+01	NA
3,3-Dichlorobenzidine	Coyote - Insectivore	0.015	0	1	0	0.028	5.55E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
4-(2,4-Dichlorophenoxy) Butyric Acid	Coyote - Insectivore	0.015	0	1	0	0.028	5.03E-01	2.89E+01	2.84E+01	8.00E-01	NA	1.84E+00	NA
4,6-Dinitro-2-methylphenol	Coyote - Insectivore	0.015	0	1	0	0.028	7.02E-01	2.74E+01	2.84E+01	1.00E+00	NA	2.43E+00	NA
4-Chloroaniline	Coyote - Insectivore	0.015	0	1	0	0.028	8.05E-01	2.69E+01	2.84E+01	1.25E+00	NA	3.10E+00	NA
4-Methyl-2-Pentanone	Coyote - Insectivore	0.015	0	1	0	0.028	9.26E-01	2.63E+01	2.85E+01	2.50E+01	NA	6.34E+01	NA
4-Nitroanoline	Coyote - Insectivore	0.015	0	1	0	0.028	8.57E-01	2.66E+01	2.85E+01	7.10E+01	NA	1.78E+02	NA
4-Nitrophenol	Coyote - Insectivore	0.015	0	1	0	0.028	7.68E-01	2.71E+01	2.84E+01	2.50E+01	NA	6.15E+01	NA
Acenaphthene	Coyote - Insectivore	0.015	0	1	0	0.028	4.38E-01	2.95E+01	2.84E+01	NA	NA	NA	NA
Acetone	Coyote - Insectivore	0.015	0	1	0	0.028	1.32E+00	2.49E+01	2.87E+01	1.00E+01	2.24E+01	2.68E+01	5.99E+01
Aldrin	Coyote - Insectivore	0.015	0	1	0	0.028	2.29E-01	3.27E+01	2.86E+01	1.00E-01	NA	2.04E-01	NA
alpha-BHC	Coyote - Insectivore	0.015	0	1	0	0.028	4.26E-01	2.97E+01	2.84E+01	3.60E+01	NA	8.08E+01	NA
Ammonium (as Ammonia)	Coyote - Insectivore	0.015	0	1	0	0.028	1.17E+00	2.53E+01	2.86E+01	9.66E+02	NA	2.54E+03	NA
Anthracene	Coyote - Insectivore	0.015	0	1	0	0.028	3.10E+00	2.98E+01	3.09E+01	NA	NA	NA	NA
Benzene	Coyote - Insectivore	0.015	0	1	0	0.028	7.53E-01	2.71E+01	2.84E+01	2.64E+01	NA	6.47E+01	NA
Benzo(a)pyrene	Coyote - Insectivore	0.015	0	1	0	0.028	2.00E-01	3.19E+01	2.85E+01	1.31E+00	6.55E+00	2.74E+00	1.37E+01
Benzyl alcohol	Coyote - Insectivore	0.015	0	1	0	0.028	9.45E-01	2.62E+01	2.85E+01	7.50E+00	NA	1.91E+01	NA
Beta-BHC	Coyote - Insectivore	0.015	0	1	0	0.028	4.26E-01	2.97E+01	2.84E+01	4.00E-01	8.94E-01	8.98E-01	2.01E+00
BHC (Mixed)	Coyote - Insectivore	0.015	0	1	0	0.028	4.26E-01	2.97E+01	2.84E+01	1.60E+00	2.26E+00	3.59E+00	5.08E+00
bis(2-chloroethyl)ether	Coyote - Insectivore	0.015	0	1	0	0.028	8.38E-01	2.67E+01	2.84E+01	NA	NA	NA	NA
bis(2-chloroisopropyl)ether	Coyote - Insectivore	0.015	0	1	0	0.028	6.81E-01	2.76E+01	2.84E+01	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	Coyote - Insectivore	0.015	0	1	0	0.028	1.52E-01	3.49E+01	2.88E+01	1.83E+01	NA	3.50E+01	NA
Bromodichloromethane	Coyote - Insectivore	0.015	0	1	0	0.028	8.28E-01	2.67E+01	2.84E+01	1.00E+01	1.41E+01	2.49E+01	3.51E+01
Bromoform	Coyote - Insectivore	0.015	0	1	0	0.028	7.91E-01	2.69E+01	2.84E+01	5.00E+00	NA	1.24E+01	NA

295

			Dietary Proportion				Bioconcentration Factors			Toxicity Reference Values		Ecological Screening Level	
ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Vegetation	Invertebrate	Small Mammal	Soil in Diet	Soil to Plant	Soil to Invertebrate	Soil to Small Mammal	NOAEL (mg/kg day)	Threshold (mg/kg day)	NOAEL (mg/kg)	Threshold (mg/kg)
Bromomethane (methyl bromide)	Coyote - Insectivore	0.015	0	1	0	0.028	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Butylbenzylphthalate	Coyote - Insectivore	0.015	0	1	0	0.028	4.04E-01	2.99E+01	2.84E+01	4.70E+01	8.16E+01	1.05E+02	1.82E+02
Carbazole	Coyote - Insectivore	0.015	0	1	0	0.028	5.52E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
Carbon disulfide	Coyote - Insectivore	0.015	0	1	0	0.028	7.62E-01	2.71E+01	2.84E+01	1.00E+01	NA	2.46E+01	NA
Carbon Tetrachloride	Coyote - Insectivore	0.015	0	1	0	0.028	6.72E-01	2.76E+01	2.84E+01	1.60E+01	NA	3.86E+01	NA
Chlordane	Coyote - Insectivore	0.015	0	1	0	0.028	2.58E-01	3.21E+01	2.86E+01	4.60E+00	NA	9.55E+00	NA
Chlorobenzene	Coyote - Insectivore	0.015	0	1	0	0.028	6.40E-01	2.78E+01	2.84E+01	8.60E+00	1.22E+01	2.06E+01	2.92E+01
Chloroform	Coyote - Insectivore	0.015	0	1	0	0.028	8.47E-01	2.66E+01	2.84E+01	1.50E+01	2.48E+01	3.75E+01	6.20E+01
cis-1,2-dichloroethene	Coyote - Insectivore	0.015	0	1	0	0.028	7.55E-01	2.71E+01	2.84E+01	3.20E+00	NA	7.86E+00	NA
DDD	Coyote - Insectivore	0.015	0	1	0	0.028	8.00E-02	3.16E+01	2.83E+01	2.82E+01	NA	5.95E+01	NA
DDE	Coyote - Insectivore	0.015	0	1	0	0.028	6.20E-01	3.27E+01	2.90E+01	1.10E+00	NA	2.24E+00	NA
DDT	Coyote - Insectivore	0.015	0	1	0	0.028	8.00E-02	3.24E+01	2.85E+01	8.00E-01	3.58E+00	1.64E+00	7.35E+00
Dibenzofuran	Coyote - Insectivore	0.015	0	1	0	0.028	4.89E-01	2.90E+01	2.84E+01	4.00E+01	NA	NA	9.18E+01
Dibromochloromethane	Coyote - Insectivore	0.015	0	1	0	0.028	8.09E-01	2.68E+01	2.84E+01	1.00E+01	NA	2.48E+01	NA
Dicamba	Coyote - Insectivore	0.015	0	1	0	0.028	7.25E-01	2.73E+01	2.84E+01	3.00E+00	NA	7.32E+00	NA
Dichlorodifluoromethane	Coyote - Insectivore	0.015	0	1	0	0.028	7.85E-01	2.70E+01	2.84E+01	1.50E+00	NA	3.71E+00	NA
Dieldrin	Coyote - Insectivore	0.015	0	1	0	0.028	1.64E+00	3.12E+01	2.97E+01	1.50E-02	2.12E-02	3.20E-02	4.53E-02
Diethyl Ether	Coyote - Insectivore	0.015	0	1	0	0.028	9.52E-01	2.62E+01	2.85E+01	5.00E+01	NA	1.27E+02	NA
Diethylphthalate	Coyote - Insectivore	0.015	0	1	0	0.028	6.38E-01	2.78E+01	2.84E+01	4.58E+03	NA	1.10E+04	NA
Dimethoate	Coyote - Insectivore	0.015	0	1	0	0.028	1.15E+00	2.54E+01	2.86E+01	NA	NA	NA	NA
Dimethylphthalate	Coyote - Insectivore	0.015	0	1	0	0.028	8.17E-01	2.68E+01	2.84E+01	3.50E+02	NA	8.70E+02	NA
Di-n-butyl phthalate	Coyote - Insectivore	0.015	0	1	0	0.028	3.91E-01	3.01E+01	2.84E+01	5.50E+02	NA	1.22E+03	NA
Di-n-octylphthalate	Coyote - Insectivore	0.015	0	1	0	0.028	1.46E-01	3.51E+01	2.88E+01	1.67E+03	3.54E+03	3.17E+03	6.72E+03
Endosulfan	Coyote - Insectivore	0.015	0	1	0	0.028	5.16E-01	2.88E+01	2.84E+01	1.50E-01	NA	3.47E-01	NA
Endrin	Coyote - Insectivore	0.015	0	1	0	0.028	3.17E-01	3.11E+01	2.85E+01	9.20E-02	NA	1.97E-01	NA
Ethyl acetate	Coyote - Insectivore	0.015	0	1	0	0.028	9.13E-01	2.63E+01	2.85E+01	9.00E+01	NA	2.28E+02	NA
Ethylbenzene	Coyote - Insectivore	0.015	0	1	0	0.028	5.80E-01	2.83E+01	2.84E+01	9.70E+00	NA	2.29E+01	NA
Fluoranthene	Coyote - Insectivore	0.015	0	1	0	0.028	6.03E+00	3.04E+01	3.37E+01	NA	NA	NA	NA
Fluorene	Coyote - Insectivore	0.015	0	1	0	0.028	6.00E-02	2.94E+01	2.80E+01	2.50E+01	NA	5.67E+01	NA
Fluoride	Coyote - Insectivore	0.015	0	1	0	0.028	1.17E+00	2.53E+01	2.86E+01	3.14E+01	NA	8.25E+01	NA
Heptachlor	Coyote - Insectivore	0.015	0	1	0	0.028	2.86E-01	3.16E+01	2.85E+01	1.30E-01	9.40E-01	2.74E-01	1.98E+00
Heptachlor epoxide	Coyote - Insectivore	0.015	0	1	0	0.028	3.96E-01	3.00E+01	2.84E+01	1.25E-01	NA	2.77E-01	NA
Hexachlorobenzene	Coyote - Insectivore	0.015	0	1	0	0.028	2.86E-01	3.16E+01	2.85E+01	2.00E+00	NA	4.22E+00	NA
Hexachlorobutadiene	Coyote - Insectivore	0.015	0	1	0	0.028	3.80E-01	3.02E+01	2.84E+01	2.00E+00	NA	4.41E+00	NA
Hexachlorocyclopentadiene	Coyote - Insectivore	0.015	0	1	0	0.028	3.89E-01	3.01E+01	2.84E+01	1.08E+01	NA	2.39E+01	NA
Hexachloroethane	Coyote - Insectivore	0.015	0	1	0	0.028	4.52E-01	2.94E+01	2.84E+01	7.00E-01	9.90E-01	1.59E+00	2.24E+00
Isophorone	Coyote - Insectivore	0.015	0	1	0	0.028	6.43E-01	2.78E+01	2.84E+01	NA	NA	NA	NA
Isopropylbenzene	Coyote - Insectivore	0.015	0	1	0	0.028	5.22E-01	2.87E+01	2.84E+01	NA	NA	NA	NA
Lindane	Coyote - Insectivore	0.015	0	1	0	0.028	4.26E-01	2.97E+01	2.84E+01	5.00E-02	NA	1.12E-01	NA
Methoxychlor	Coyote - Insectivore	0.015	0	1	0	0.028	3.00E-01	3.13E+01	2.85E+01	2.50E+00	NA	5.31E+00	NA
Methyl Ethyl Ketone	Coyote - Insectivore	0.015	0	1	0	0.028	1.16E+00	2.54E+01	2.86E+01	1.77E+03	NA	4.64E+03	NA
Methyl Methacrylate	Coyote - Insectivore	0.015	0	1	0	0.028	8.99E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Methylene Chloride	Coyote - Insectivore	0.015	0	1	0	0.028	8.86E-01	2.65E+01	2.85E+01	5.85E+00	1.71E+01	1.47E+01	4.31E+01
Methyl-tertbutyl ether	Coyote - Insectivore	0.015	0	1	0	0.028	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Napthalene	Coyote - Insectivore	0.015	0	1	0	0.028	4.19E+00	2.84E+01	3.19E+01	5.00E+01	8.66E+01	1.17E+02	2.03E+02
n-Nitrosodiphenylamine	Coyote - Insectivore	0.015	0	1	0	0.028	8.53E-01	2.66E+01	2.85E+01	5.80E+01	1.16E+02	1.45E+02	2.90E+02
n-Nitrosodipropylamine	Coyote - Insectivore	0.015	0	1	0	0.028	8.88E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	Coyote - Insectivore	0.015	0	1	0	0.028	1.01E+00	2.59E+01	2.85E+01	2.70E+01	NA	6.94E+01	NA
Pendimethalin	Coyote - Insectivore	0.015	0	1	0	0.028	3.71E-01	3.03E+01	2.84E+01	2.50E+00	NA	5.49E+00	NA
Pentachlorobenzene	Coyote - Insectivore	0.015	0	1	0	0.028	3.52E-01	3.06E+01	2.85E+01	8.50E-01	NA	1.85E+00	NA
Pentachloronitrobenzene	Coyote - Insectivore	0.015	0	1	0	0.028	3.52E-01	3.06E+01	2.85E+01	NA	NA	NA	NA
Pentachloronitrobenzene	Coyote - Insectivore	0.015	0	1	0	0.028	3.52E-01	3.06E+01	2.85E+01	2.00E+02	NA	4.36E+02	NA
Pentachlorophenol	Coyote - Insectivore	0.015	0	1	0	0.028	3.73E-01	3.03E+01	2.84E+01	2.40E-01	7.60E-01	5.28E-01	1.67E+00
Phenol	Coyote - Insectivore	0.015	0	1	0	0.028	8.49E-01	2.66E+01	2.85E+01	4.00E+01	NA	1.00E+02	NA
p-Nitrotoluene	Coyote - Insectivore	0.015	0	1	0	0.028	6.86E-01	2.75E+01	2.84E+01	1.10E+02	1.17E+02	2.66E+02	2.84E+02
Pyrene	Coyote - Insectivore	0.015	0	1	0	0.028	3.70E+00	3.04E+01	3.15E+01	NA	NA	NA	NA
Styrene	Coyote - Insectivore	0.015	0	1	0	0.028	6.01E-01	2.81E+01	2.84E+01	3.00E+01	3.46E+01	7.11E+01	8.20E+01
Sulfotep	Coyote - Insectivore	0.015	0	1	0	0.028	4.57E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
Toluene	Coyote - Insectivore	0.015	0	1	0	0.028	6.56E-01	2.77E+01	2.84E+01	2.60E+01	NA	6.25E+01	NA
Toxaphene	Coyote - Insectivore	0.015	0	1	0	0.028	2.26E-01	3.27E+01	2.86E+01	8.00E+00	NA	1.63E+01	NA
trans-1,2-dichloroethene	Coyote - Insectivore	0.015	0	1	0	0.028	7.55E-01	2.71E+01	2.84E+01	4.52E+01	NA	1.11E+02	NA

296

Attachment Table 5

ESL Calculations for Organic ECOIs

ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Dietary Proportion				Bioconcentration Factors			Toxicity Reference Values		Ecological Screening Level	
			Vegetation	Invertebrate	Small Mammal	Soil in Diet	Soil to Plant	Soil to Invertebrate	Soil to Small Mammal	NOAEL (mg/kg day)	Threshold (mg/kg day)	NOAEL (mg/kg)	Threshold (mg/kg)
Trichloroethene	Coyote - Insectivore	0.015	0	1	0	0.028	6.67E-01	2.77E+01	2.84E+01	7.00E-01	NA	1.69E+00	NA
Trichlorofluoromethane	Coyote - Insectivore	0.015	0	1	0	0.028	7.19E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
Trifluralin	Coyote - Insectivore	0.015	0	1	0	0.028	3.28E-01	3.09E+01	2.85E+01	3.25E+00	NA	7.01E+00	NA
Vinyl acetate	Coyote - Insectivore	0.015	0	1	0	0.028	1.03E+00	2.58E+01	2.85E+01	2.35E+01	NA	6.06E+01	NA
Vinyl Chloride	Coyote - Insectivore	0.015	0	1	0	0.028	8.26E-01	2.67E+01	2.84E+01	1.70E-01	NA	4.23E-01	NA
Xylene (Mixed)	Coyote - Insectivore	0.015	0	1	0	0.028	5.72E-01	2.83E+01	2.84E+01	2.10E+00	2.34E+00	4.94E+00	5.49E+00
1,1,1-Trichloroethane	Deer Mouse - Herbivore	0.111	1	0	0	0.02	6.33E-01	2.79E+01	2.84E+01	1.00E+03	NA	1.38E+04	NA
1,1,2,2-Tetrachloroethane	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.15E-01	2.74E+01	2.84E+01	1.08E+02	NA	1.32E+03	NA
1,1,2-Trichloroethane	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.49E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
1,1-Dichloroethane	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.97E-01	2.69E+01	2.84E+01	5.46E+00	NA	6.02E+01	NA
1,1-Dichloroethene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.29E-01	2.73E+01	2.84E+01	3.00E+01	NA	3.61E+02	NA
1,2,3-Trichloropropane	Deer Mouse - Herbivore	0.111	1	0	0	0.02	6.62E-01	2.77E+01	2.84E+01	2.50E+01	NA	3.30E+02	NA
1,2,4,5-Tetrachlorobenzene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	3.95E-01	3.00E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trichlorobenzene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	4.63E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trimethylbenzene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	4.99E-01	2.89E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	Deer Mouse - Herbivore	0.111	1	0	0	0.02	5.45E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichloroethane	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.83E-01	2.70E+01	2.84E+01	5.00E+01	NA	5.61E+02	NA
1,2-Dichloroethene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.55E-01	2.71E+01	2.84E+01	4.52E+01	NA	5.26E+02	NA
1,2-Dichloropropane	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.05E-01	2.74E+01	2.84E+01	8.90E+01	1.26E+02	1.11E+03	1.57E+03
1,3,5-Trimethylbenzene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	4.99E-01	2.89E+01	2.84E+01	1.43E+01	NA	2.48E+02	NA
1,3-Dichloropropene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	6.98E-01	2.75E+01	2.84E+01	5.00E+00	8.66E+00	6.27E+01	1.09E+02
1,3-Isobenzofurnadione	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.38E-01	2.72E+01	2.84E+01	7.57E+02	NA	9.00E+03	NA
1,4 Dioxane	Deer Mouse - Herbivore	0.111	1	0	0	0.02	1.34E+00	2.48E+01	2.88E+01	2.96E+01	NA	1.96E+02	NA
1,4-Dichlorobenzene (-p)	Deer Mouse - Herbivore	0.111	1	0	0	0.02	5.45E-01	2.85E+01	2.84E+01	1.07E+02	1.51E+02	1.71E+03	2.41E+03
1-Methyl napthalene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	4.88E-01	2.90E+01	2.84E+01	1.40E+01	NA	2.48E+02	NA
2,3,4,6 Tetrachlorophenol	Deer Mouse - Herbivore	0.111	1	0	0	0.02	4.45E-01	2.95E+01	2.84E+01	1.00E+01	NA	1.94E+02	NA
2,4,5-Trichlorophenol	Deer Mouse - Herbivore	0.111	1	0	0	0.02	5.22E-01	2.87E+01	2.84E+01	1.00E+01	1.73E+01	1.66E+02	2.87E+02
2,4,5-Trichlorophenoxy Acetic Acid	Deer Mouse - Herbivore	0.111	1	0	0	0.02	5.48E-01	2.85E+01	2.84E+01	3.00E-01	5.50E-01	4.76E+00	8.73E+00
2,4,6-Trichlorophenol	Deer Mouse - Herbivore	0.111	1	0	0	0.02	5.22E-01	2.87E+01	2.84E+01	3.00E-01	NA	4.98E+00	NA
2,4,6-Trinitrotoluene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.53E-01	2.71E+01	2.84E+01	5.00E-01	1.18E+00	5.83E+00	1.38E+01
2,4-Dichlorophenol	Deer Mouse - Herbivore	0.111	1	0	0	0.02	6.15E-01	2.80E+01	2.84E+01	5.00E+00	NA	7.10E+01	NA
2,4-Dinitrophenol	Deer Mouse - Herbivore	0.111	1	0	0	0.02	8.03E-01	2.69E+01	2.84E+01	1.25E+02	2.09E+02	1.37E+03	2.29E+03
2,4-Dinitrotoluene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.18E-01	2.73E+01	2.84E+01	5.70E-02	NA	6.96E-01	NA
2,6-Dinitrotoluene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.18E-01	2.73E+01	2.84E+01	1.10E+01	1.96E+01	1.34E+02	2.40E+02
2-Chloronaphthalene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	4.77E-01	2.91E+01	2.84E+01	NA	NA	NA	NA
2-Chlorophenol	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.21E-01	2.73E+01	2.84E+01	5.00E-01	NA	6.08E+00	NA
2-Methylnaphthalene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	4.88E-01	2.90E+01	2.84E+01	5.23E+00	7.61E+00	9.27E+01	1.35E+02
2-Methylphenol	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.40E-01	2.72E+01	2.84E+01	2.19E+02	NA	2.60E+03	NA
2-Nitroaniline	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.47E-01	2.72E+01	2.84E+01	1.00E+01	NA	1.17E+02	NA
3,3-Dichlorobenzidine	Deer Mouse - Herbivore	0.111	1	0	0	0.02	5.55E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
4-(2,4-Dichlorophenoxy) Butyric Acid	Deer Mouse - Herbivore	0.111	1	0	0	0.02	5.03E-01	2.89E+01	2.84E+01	8.00E-01	NA	1.38E+01	NA
4,6-Dinitro-2-methylphenol	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.02E-01	2.74E+01	2.84E+01	1.00E+00	NA	1.25E+01	NA
4-Chloroaniline	Deer Mouse - Herbivore	0.111	1	0	0	0.02	8.05E-01	2.69E+01	2.84E+01	1.25E+00	NA	1.36E+01	NA
4-Methyl-2-Pentanone	Deer Mouse - Herbivore	0.111	1	0	0	0.02	9.26E-01	2.63E+01	2.85E+01	2.50E+01	NA	2.38E+02	NA
4-Nitroanoline	Deer Mouse - Herbivore	0.111	1	0	0	0.02	8.57E-01	2.66E+01	2.85E+01	7.10E+01	NA	7.29E+02	NA
4-Nitrophenol	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.68E-01	2.71E+01	2.84E+01	2.50E+01	NA	2.86E+02	NA
Acenaphthene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	4.38E-01	2.95E+01	2.84E+01	NA	NA	NA	NA
Acetone	Deer Mouse - Herbivore	0.111	1	0	0	0.02	1.32E+00	2.49E+01	2.87E+01	1.00E+01	2.24E+01	6.75E+01	1.51E+02
Aldrin	Deer Mouse - Herbivore	0.111	1	0	0	0.02	2.29E-01	3.27E+01	2.86E+01	1.00E-01	NA	3.62E+00	NA
alpha-BHC	Deer Mouse - Herbivore	0.111	1	0	0	0.02	4.26E-01	2.97E+01	2.84E+01	3.60E+01	NA	7.26E+02	NA
Ammonium (as Ammonia)	Deer Mouse - Herbivore	0.111	1	0	0	0.02	1.17E+00	2.53E+01	2.86E+01	9.66E+02	NA	7.32E+03	NA
Anthracene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	3.10E+00	2.98E+01	3.09E+01	NA	NA	NA	NA
Benzene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.53E-01	2.71E+01	2.84E+01	2.64E+01	NA	3.07E+02	NA
Benzo(a)pyrene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	2.00E-01	3.19E+01	2.85E+01	1.31E+00	6.55E+00	5.36E+01	2.68E+02
Benzyl alcohol	Deer Mouse - Herbivore	0.111	1	0	0	0.02	9.45E-01	2.62E+01	2.85E+01	7.50E+00	NA	7.00E+01	NA
Beta-BHC	Deer Mouse - Herbivore	0.111	1	0	0	0.02	4.26E-01	2.97E+01	2.84E+01	4.00E-01	8.94E-01	8.07E+00	1.81E+01
BHC (Mixed)	Deer Mouse - Herbivore	0.111	1	0	0	0.02	4.26E-01	2.97E+01	2.84E+01	1.60E+00	2.26E+00	3.23E+01	4.57E+01
bis(2-chloroethyl)ether	Deer Mouse - Herbivore	0.111	1	0	0	0.02	8.38E-01	2.67E+01	2.84E+01	NA	NA	NA	NA
bis(2-chloroisopropyl)ether	Deer Mouse - Herbivore	0.111	1	0	0	0.02	6.81E-01	2.76E+01	2.84E+01	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	Deer Mouse - Herbivore	0.111	1	0	0	0.02	1.52E-01	3.49E+01	2.88E+01	1.83E+01	NA	9.60E+02	NA
Bromodichloromethane	Deer Mouse - Herbivore	0.111	1	0	0	0.02	8.28E-01	2.67E+01	2.84E+01	1.00E+01	1.41E+01	1.06E+02	1.50E+02

297

Attachment Table 5
ESL Calculations for Organic ECOIs

			Dietary Proportion				Bioconcentration Factors			Toxicity Reference Values		Ecological Screening Level	
ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Vegetation	Invertebrate	Small Mammal	Soil in Diet	Soil to Plant	Soil to Invertebrate	Soil to Small Mammal	NOAEL (mg/kg day)	Threshold (mg/kg day)	NOAEL (mg/kg)	Threshold (mg/kg)
Bromoform	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.91E-01	2.69E+01	2.84E+01	5.00E+00	NA	5.55E+01	NA
Bromomethane (methyl bromide)	Deer Mouse - Herbivore	0.111	1	0	0	0.02	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Butylbenzylphthalate	Deer Mouse - Herbivore	0.111	1	0	0	0.02	4.04E-01	2.99E+01	2.84E+01	4.70E+01	8.16E+01	1.00E+03	1.74E+03
Carbazole	Deer Mouse - Herbivore	0.111	1	0	0	0.02	5.52E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
Carbon disulfide	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.62E-01	2.71E+01	2.84E+01	1.00E+01	NA	1.15E+02	NA
Carbon Tetrachloride	Deer Mouse - Herbivore	0.111	1	0	0	0.02	6.72E-01	2.76E+01	2.84E+01	1.60E+01	NA	2.08E+02	NA
Chlordane	Deer Mouse - Herbivore	0.111	1	0	0	0.02	2.58E-01	3.21E+01	2.86E+01	4.60E+00	NA	1.49E+02	NA
Chlorobenzene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	6.40E-01	2.78E+01	2.84E+01	8.60E+00	1.22E+01	1.17E+02	1.67E+02
Chloroform	Deer Mouse - Herbivore	0.111	1	0	0	0.02	8.47E-01	2.66E+01	2.84E+01	1.50E+01	2.48E+01	1.56E+02	2.58E+02
cis-1,2-dichloroethene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.55E-01	2.71E+01	2.84E+01	3.20E+00	NA	3.72E+01	NA
DDD	Deer Mouse - Herbivore	0.111	1	0	0	0.02	8.00E-02	3.16E+01	2.83E+01	2.82E+01	NA	2.54E+03	NA
DDE	Deer Mouse - Herbivore	0.111	1	0	0	0.02	6.20E-01	3.27E+01	2.90E+01	1.10E+00	NA	1.55E+01	NA
DDT	Deer Mouse - Herbivore	0.111	1	0	0	0.02	8.00E-02	3.24E+01	2.85E+01	8.00E-01	3.58E+00	7.21E+01	3.22E+02
Dibenzofuran	Deer Mouse - Herbivore	0.111	1	0	0	0.02	4.89E-01	2.90E+01	2.84E+01	4.00E+01	NA	NA	7.07E+02
Dibromochloromethane	Deer Mouse - Herbivore	0.111	1	0	0	0.02	8.09E-01	2.68E+01	2.84E+01	1.00E+01	NA	1.09E+02	NA
Dicamba	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.25E-01	2.73E+01	2.84E+01	3.00E+00	NA	3.63E+01	NA
Dichlorodifluoromethane	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.85E-01	2.70E+01	2.84E+01	1.50E+00	NA	1.68E+01	NA
Dieldrin	Deer Mouse - Herbivore	0.111	1	0	0	0.02	1.64E+00	3.12E+01	2.97E+01	1.50E-02	2.12E-02	8.14E-02	1.15E-01
Diethyl Ether	Deer Mouse - Herbivore	0.111	1	0	0	0.02	9.52E-01	2.62E+01	2.85E+01	5.00E+01	NA	4.63E+02	NA
Diethylphthalate	Deer Mouse - Herbivore	0.111	1	0	0	0.02	6.38E-01	2.78E+01	2.84E+01	4.58E+03	NA	6.27E+04	NA
Dimethoate	Deer Mouse - Herbivore	0.111	1	0	0	0.02	1.15E+00	2.54E+01	2.86E+01	NA	NA	NA	NA
Dimethylphthalate	Deer Mouse - Herbivore	0.111	1	0	0	0.02	8.17E-01	2.68E+01	2.84E+01	3.50E+02	NA	3.77E+03	NA
Di-n-butyl phthalate	Deer Mouse - Herbivore	0.111	1	0	0	0.02	3.91E-01	3.01E+01	2.84E+01	5.50E+02	NA	1.21E+04	NA
Di-n-octylphthalate	Deer Mouse - Herbivore	0.111	1	0	0	0.02	1.46E-01	3.51E+01	2.88E+01	1.67E+03	3.54E+03	9.05E+04	1.92E+05
Endosulfan	Deer Mouse - Herbivore	0.111	1	0	0	0.02	5.16E-01	2.88E+01	2.84E+01	1.50E-01	NA	2.52E+00	NA
Endrin	Deer Mouse - Herbivore	0.111	1	0	0	0.02	3.17E-01	3.11E+01	2.85E+01	9.20E-02	NA	2.46E+00	NA
Ethyl acetate	Deer Mouse - Herbivore	0.111	1	0	0	0.02	9.13E-01	2.63E+01	2.85E+01	9.00E+01	NA	8.69E+02	NA
Ethylbenzene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	5.80E-01	2.83E+01	2.84E+01	9.70E+00	NA	1.46E+02	NA
Fluoranthene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	6.03E+00	3.04E+01	3.37E+01	NA	NA	NA	NA
Fluorene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	6.00E-02	2.94E+01	2.80E+01	2.50E+01	NA	2.82E+03	NA
Fluoride	Deer Mouse - Herbivore	0.111	1	0	0	0.02	1.17E+00	2.53E+01	2.86E+01	3.14E+01	NA	2.37E+02	NA
Heptachlor	Deer Mouse - Herbivore	0.111	1	0	0	0.02	2.86E-01	3.16E+01	2.85E+01	1.30E-01	9.40E-01	3.83E+00	2.77E+01
Heptachlor epoxide	Deer Mouse - Herbivore	0.111	1	0	0	0.02	3.96E-01	3.00E+01	2.84E+01	1.25E-01	NA	2.71E+00	NA
Hexachlorobenzene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	2.86E-01	3.16E+01	2.85E+01	2.00E+00	NA	5.89E+01	NA
Hexachlorobutadiene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	3.80E-01	3.02E+01	2.84E+01	2.00E+00	NA	4.50E+01	NA
Hexachlorocyclopentadiene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	3.89E-01	3.01E+01	2.84E+01	1.08E+01	NA	2.38E+02	NA
Hexachloroethane	Deer Mouse - Herbivore	0.111	1	0	0	0.02	4.52E-01	2.94E+01	2.84E+01	7.00E-01	9.90E-01	1.34E+01	1.89E+01
Isophorone	Deer Mouse - Herbivore	0.111	1	0	0	0.02	6.43E-01	2.78E+01	2.84E+01	NA	NA	NA	NA
Isopropylbenzene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	5.22E-01	2.87E+01	2.84E+01	NA	NA	NA	NA
Lindane	Deer Mouse - Herbivore	0.111	1	0	0	0.02	4.26E-01	2.97E+01	2.84E+01	5.00E-02	NA	1.01E+00	NA
Methoxychlor	Deer Mouse - Herbivore	0.111	1	0	0	0.02	3.00E-01	3.13E+01	2.85E+01	2.50E+00	NA	7.05E+01	NA
Methyl Ethyl Ketone	Deer Mouse - Herbivore	0.111	1	0	0	0.02	1.16E+00	2.54E+01	2.86E+01	1.77E+03	NA	1.35E+04	NA
Methyl Methacrylate	Deer Mouse - Herbivore	0.111	1	0	0	0.02	8.99E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Methylene Chloride	Deer Mouse - Herbivore	0.111	1	0	0	0.02	8.86E-01	2.65E+01	2.85E+01	5.85E+00	1.71E+01	5.82E+01	1.70E+02
Methyl-tertbutyl ether	Deer Mouse - Herbivore	0.111	1	0	0	0.02	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Napthalene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	4.19E+00	2.84E+01	3.19E+01	5.00E+01	8.66E+01	1.07E+02	1.85E+02
n-Nitrosodiphenylamine	Deer Mouse - Herbivore	0.111	1	0	0	0.02	8.53E-01	2.66E+01	2.85E+01	5.80E+01	1.16E+02	5.99E+02	1.20E+03
n-Nitrosodipropylamine	Deer Mouse - Herbivore	0.111	1	0	0	0.02	8.88E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	Deer Mouse - Herbivore	0.111	1	0	0	0.02	1.01E+00	2.59E+01	2.85E+01	2.70E+01	NA	2.36E+02	NA
Pendimethalin	Deer Mouse - Herbivore	0.111	1	0	0	0.02	3.71E-01	3.03E+01	2.84E+01	2.50E+00	NA	5.77E+01	NA
Pentachlorobenzene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	3.52E-01	3.06E+01	2.85E+01	8.50E-01	NA	2.06E+01	NA
Pentachloronitrobenzene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	3.52E-01	3.06E+01	2.85E+01	NA	NA	NA	NA
Pentachloronitrobenzene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	3.52E-01	3.06E+01	2.85E+01	2.00E+02	NA	4.85E+03	NA
Pentachlorophenol	Deer Mouse - Herbivore	0.111	1	0	0	0.02	3.73E-01	3.03E+01	2.84E+01	2.40E-01	7.60E-01	5.50E+00	1.74E+01
Phenol	Deer Mouse - Herbivore	0.111	1	0	0	0.02	8.49E-01	2.66E+01	2.85E+01	4.00E+01	NA	4.15E+02	NA
p-Nitrotoluene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	6.86E-01	2.75E+01	2.84E+01	1.10E+02	1.17E+02	1.40E+03	1.50E+03
Pyrene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	3.70E+00	3.04E+01	3.15E+01	NA	NA	NA	NA
Styrene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	6.01E-01	2.81E+01	2.84E+01	3.00E+01	3.46E+01	4.35E+02	5.02E+02
Sulfotep	Deer Mouse - Herbivore	0.111	1	0	0	0.02	4.57E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
Toluene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	6.56E-01	2.77E+01	2.84E+01	2.60E+01	NA	3.47E+02	NA
Toxaphene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	2.26E-01	3.27E+01	2.86E+01	8.00E+00	NA	2.93E+02	NA

298

Attachment Table 5
ESL Calculations for Organic ECOIs

			Dietary Proportion				Bioconcentration Factors			Toxicity Reference Values		Ecological Screening Level	
ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Vegetation	Invertebrate	Small Mammal	Soil in Diet	Soil to Plant	Soil to Invertebrate	Soil to Small Mammal	NOAEL (mg/kg day)	Threshold (mg/kg day)	NOAEL (mg/kg)	Threshold (mg/kg)
trans-1,2-dichloroethene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.55E-01	2.71E+01	2.84E+01	4.52E+01	NA	5.26E+02	NA
Trichloroethene	Deer Mouse - Herbivore	0.111	1	0	0	0.02	6.67E-01	2.77E+01	2.84E+01	7.00E-01	NA	9.17E+00	NA
Trichlorofluoromethane	Deer Mouse - Herbivore	0.111	1	0	0	0.02	7.19E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
Trifluralin	Deer Mouse - Herbivore	0.111	1	0	0	0.02	3.28E-01	3.09E+01	2.85E+01	3.25E+00	NA	8.42E+01	NA
Vinyl acetate	Deer Mouse - Herbivore	0.111	1	0	0	0.02	1.03E+00	2.58E+01	2.85E+01	2.35E+01	NA	2.01E+02	NA
Vinyl Chloride	Deer Mouse - Herbivore	0.111	1	0	0	0.02	8.26E-01	2.67E+01	2.84E+01	1.70E-01	NA	1.81E+00	NA
Xylene (Mixed)	Deer Mouse - Herbivore	0.111	1	0	0	0.02	5.72E-01	2.83E+01	2.84E+01	2.10E+00	2.34E+00	3.20E+01	3.56E+01
1,1,1-Trichloroethane	Deer Mouse - Insectivore	0.065	0	1	0	0.02	6.33E-01	2.79E+01	2.84E+01	1.00E+03	NA	5.51E+02	NA
1,1,2,2-Tetrachloroethane	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.15E-01	2.74E+01	2.84E+01	1.08E+02	NA	6.07E+01	NA
1,1,2-Trichloroethane	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.49E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
1,1-Dichloroethane	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.97E-01	2.69E+01	2.84E+01	5.46E+00	NA	3.12E+00	NA
1,1-Dichloroethene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.29E-01	2.73E+01	2.84E+01	3.00E+01	NA	1.69E+01	NA
1,2,3-Trichloropropane	Deer Mouse - Insectivore	0.065	0	1	0	0.02	6.62E-01	2.77E+01	2.84E+01	2.50E+01	NA	1.39E+01	NA
1,2,4,5-Tetrachlorobenzene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	3.95E-01	3.00E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trichlorobenzene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	4.63E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trimethylbenzene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	4.99E-01	2.89E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	Deer Mouse - Insectivore	0.065	0	1	0	0.02	5.45E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichloroethane	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.83E-01	2.70E+01	2.84E+01	5.00E+01	NA	2.85E+01	NA
1,2-Dichloroethene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.55E-01	2.71E+01	2.84E+01	4.52E+01	NA	2.56E+01	NA
1,2-Dichloropropane	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.05E-01	2.74E+01	2.84E+01	8.90E+01	1.26E+02	4.99E+01	7.08E+01
1,3,5-Trimethylbenzene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	4.99E-01	2.89E+01	2.84E+01	1.43E+01	NA	7.60E+00	NA
1,3-Dichloropropene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	6.98E-01	2.75E+01	2.84E+01	5.00E+00	8.66E+00	2.80E+00	4.85E+00
1,3-Isobenzofurnadione	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.38E-01	2.72E+01	2.84E+01	7.57E+02	NA	4.28E+02	NA
1,4 Dioxane	Deer Mouse - Insectivore	0.065	0	1	0	0.02	1.34E+00	2.48E+01	2.88E+01	2.96E+01	NA	1.84E+01	NA
1,4-Dichlorobenzene (-p)	Deer Mouse - Insectivore	0.065	0	1	0	0.02	5.45E-01	2.85E+01	2.84E+01	1.07E+02	1.51E+02	5.76E+01	8.15E+01
1-Methyl napthalene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	4.88E-01	2.90E+01	2.84E+01	1.40E+01	NA	7.41E+00	NA
2,3,4,6 Tetrachlorophenol	Deer Mouse - Insectivore	0.065	0	1	0	0.02	4.45E-01	2.95E+01	2.84E+01	1.00E+01	NA	5.22E+00	NA
2,4,5-Trichlorophenol	Deer Mouse - Insectivore	0.065	0	1	0	0.02	5.22E-01	2.87E+01	2.84E+01	1.00E+01	1.73E+01	5.35E+00	9.26E+00
2,4,5-Trichlorophenoxy Acetic Acid	Deer Mouse - Insectivore	0.065	0	1	0	0.02	5.48E-01	2.85E+01	2.84E+01	3.00E-01	5.50E-01	1.62E-01	2.96E-01
2,4,6-Trichlorophenol	Deer Mouse - Insectivore	0.065	0	1	0	0.02	5.22E-01	2.87E+01	2.84E+01	3.00E-01	NA	1.61E-01	NA
2,4,6-Trinitrotoluene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.53E-01	2.71E+01	2.84E+01	5.00E-01	1.18E+00	2.83E-01	6.68E-01
2,4-Dichlorophenol	Deer Mouse - Insectivore	0.065	0	1	0	0.02	6.15E-01	2.80E+01	2.84E+01	5.00E+00	NA	2.74E+00	NA
2,4-Dinitrophenol	Deer Mouse - Insectivore	0.065	0	1	0	0.02	8.03E-01	2.69E+01	2.84E+01	1.25E+02	2.09E+02	7.15E+01	1.20E+02
2,4-Dinitrotoluene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.18E-01	2.73E+01	2.84E+01	5.70E-02	NA	3.21E-02	NA
2,6-Dinitrotoluene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.18E-01	2.73E+01	2.84E+01	1.10E+01	1.96E+01	6.19E+00	1.10E+01
2-Chloronaphthalene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	4.77E-01	2.91E+01	2.84E+01	NA	NA	NA	NA
2-Chlorophenol	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.21E-01	2.73E+01	2.84E+01	5.00E-01	NA	2.81E-01	NA
2-Methylnaphthalene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	4.88E-01	2.90E+01	2.84E+01	5.23E+00	7.61E+00	2.77E+00	4.03E+00
2-Methylphenol	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.40E-01	2.72E+01	2.84E+01	2.19E+02	NA	1.24E+02	NA
2-Nitroaniline	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.47E-01	2.72E+01	2.84E+01	1.00E+01	NA	5.66E+00	NA
3,3-Dichlorobenzidine	Deer Mouse - Insectivore	0.065	0	1	0	0.02	5.55E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
4-(2,4-Dichlorophenoxy) Butyric Acid	Deer Mouse - Insectivore	0.065	0	1	0	0.02	5.03E-01	2.89E+01	2.84E+01	8.00E-01	NA	4.26E-01	NA
4,6-Dinitro-2-methylphenol	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.02E-01	2.74E+01	2.84E+01	1.00E+00	NA	5.60E-01	NA
4-Chloroaniline	Deer Mouse - Insectivore	0.065	0	1	0	0.02	8.05E-01	2.69E+01	2.84E+01	1.25E+00	NA	7.16E-01	NA
4-Methyl-2-Pentanone	Deer Mouse - Insectivore	0.065	0	1	0	0.02	9.26E-01	2.63E+01	2.85E+01	2.50E+01	NA	1.46E+01	NA
4-Nitroanoline	Deer Mouse - Insectivore	0.065	0	1	0	0.02	8.57E-01	2.66E+01	2.85E+01	7.10E+01	NA	4.10E+01	NA
4-Nitrophenol	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.68E-01	2.71E+01	2.84E+01	2.50E+01	NA	1.42E+01	NA
Acenaphthene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	4.38E-01	2.95E+01	2.84E+01	NA	NA	NA	NA
Acetone	Deer Mouse - Insectivore	0.065	0	1	0	0.02	1.32E+00	2.49E+01	2.87E+01	1.00E+01	2.24E+01	6.18E+00	1.38E+01
Aldrin	Deer Mouse - Insectivore	0.065	0	1	0	0.02	2.29E-01	3.27E+01	2.86E+01	1.00E-01	NA	4.70E-02	NA
alpha-BHC	Deer Mouse - Insectivore	0.065	0	1	0	0.02	4.26E-01	2.97E+01	2.84E+01	3.60E+01	NA	1.87E+01	NA
Ammonium (as Ammonia)	Deer Mouse - Insectivore	0.065	0	1	0	0.02	1.17E+00	2.53E+01	2.86E+01	9.66E+02	NA	5.86E+02	NA
Anthracene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	3.10E+00	2.98E+01	3.09E+01	NA	NA	NA	NA
Benzene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.53E-01	2.71E+01	2.84E+01	2.64E+01	NA	1.49E+01	NA
Benzo(a)pyrene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	2.00E-01	3.19E+01	2.85E+01	1.31E+00	6.55E+00	6.32E-01	3.16E+00
Benzyl alcohol	Deer Mouse - Insectivore	0.065	0	1	0	0.02	9.45E-01	2.62E+01	2.85E+01	7.50E+00	NA	4.40E+00	NA
Beta-BHC	Deer Mouse - Insectivore	0.065	0	1	0	0.02	4.26E-01	2.97E+01	2.84E+01	4.00E-01	8.94E-01	2.07E-01	4.64E-01
BHC (Mixed)	Deer Mouse - Insectivore	0.065	0	1	0	0.02	4.26E-01	2.97E+01	2.84E+01	1.60E+00	2.26E+00	8.29E-01	1.17E+00
bis(2-chloroethyl)ether	Deer Mouse - Insectivore	0.065	0	1	0	0.02	8.38E-01	2.67E+01	2.84E+01	NA	NA	NA	NA
bis(2-chloroisopropyl)ether	Deer Mouse - Insectivore	0.065	0	1	0	0.02	6.81E-01	2.76E+01	2.84E+01	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	Deer Mouse - Insectivore	0.065	0	1	0	0.02	1.52E-01	3.49E+01	2.88E+01	1.83E+01	NA	8.07E+00	NA

299

Attachment Table 5
ESL Calculations for Organic ECOIs

			Dietary Proportion				Bioconcentration Factors			Toxicity Reference Values		Ecological Screening Level	
ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Vegetation	Invertebrate	Small Mammal	Soil in Diet	Soil to Plant	Soil to Invertebrate	Soil to Small Mammal	NOAEL (mg/kg day)	Threshold (mg/kg day)	NOAEL (mg/kg)	Threshold (mg/kg)
Bromodichloromethane	Deer Mouse - Insectivore	0.065	0	1	0	0.02	8.28E-01	2.67E+01	2.84E+01	1.00E+01	1.41E+01	5.75E+00	8.11E+00
Bromoform	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.91E-01	2.69E+01	2.84E+01	5.00E+00	NA	2.85E+00	NA
Bromomethane (methyl bromide)	Deer Mouse - Insectivore	0.065	0	1	0	0.02	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Butylbenzylphthalate	Deer Mouse - Insectivore	0.065	0	1	0	0.02	4.04E-01	2.99E+01	2.84E+01	4.70E+01	8.16E+01	2.42E+01	4.19E+01
Carbazole	Deer Mouse - Insectivore	0.065	0	1	0	0.02	5.52E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
Carbon disulfide	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.62E-01	2.71E+01	2.84E+01	1.00E+01	NA	5.68E+00	NA
Carbon Tetrachloride	Deer Mouse - Insectivore	0.065	0	1	0	0.02	6.72E-01	2.76E+01	2.84E+01	1.60E+01	NA	8.91E+00	NA
Chlordane	Deer Mouse - Insectivore	0.065	0	1	0	0.02	2.58E-01	3.21E+01	2.86E+01	4.60E+00	NA	2.21E+00	NA
Chlorobenzene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	6.40E-01	2.78E+01	2.84E+01	8.60E+00	1.22E+01	4.75E+00	6.74E+00
Chloroform	Deer Mouse - Insectivore	0.065	0	1	0	0.02	8.47E-01	2.66E+01	2.84E+01	1.50E+01	2.48E+01	8.66E+00	1.43E+01
cis-1,2-dichloroethene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.55E-01	2.71E+01	2.84E+01	3.20E+00	NA	1.81E+00	NA
DDD	Deer Mouse - Insectivore	0.065	0	1	0	0.02	8.00E-02	3.16E+01	2.83E+01	2.82E+01	NA	1.37E+01	NA
DDE	Deer Mouse - Insectivore	0.065	0	1	0	0.02	6.20E-01	3.27E+01	2.90E+01	1.10E+00	NA	5.17E-01	NA
DDT	Deer Mouse - Insectivore	0.065	0	1	0	0.02	8.00E-02	3.24E+01	2.85E+01	8.00E-01	3.58E+00	3.79E-01	1.70E+00
Dibenzofuran	Deer Mouse - Insectivore	0.065	0	1	0	0.02	4.89E-01	2.90E+01	2.84E+01	4.00E+01	NA	NA	2.12E+01
Dibromochloromethane	Deer Mouse - Insectivore	0.065	0	1	0	0.02	8.09E-01	2.68E+01	2.84E+01	1.00E+01	NA	5.73E+00	NA
Dicamba	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.25E-01	2.73E+01	2.84E+01	3.00E+00	NA	1.69E+00	NA
Dichlorodifluoromethane	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.85E-01	2.70E+01	2.84E+01	1.50E+00	NA	8.55E-01	NA
Dieldrin	Deer Mouse - Insectivore	0.065	0	1	0	0.02	1.64E+00	3.12E+01	2.97E+01	1.50E-02	2.12E-02	7.40E-03	1.05E-02
Diethyl Ether	Deer Mouse - Insectivore	0.065	0	1	0	0.02	9.52E-01	2.62E+01	2.85E+01	5.00E+01	NA	2.94E+01	NA
Diethylphthalate	Deer Mouse - Insectivore	0.065	0	1	0	0.02	6.38E-01	2.78E+01	2.84E+01	4.58E+03	NA	2.53E+03	NA
Dimethoate	Deer Mouse - Insectivore	0.065	0	1	0	0.02	1.15E+00	2.54E+01	2.86E+01	NA	NA	NA	NA
Dimethylphthalate	Deer Mouse - Insectivore	0.065	0	1	0	0.02	8.17E-01	2.68E+01	2.84E+01	3.50E+02	NA	2.01E+02	NA
Di-n-butyl phthalate	Deer Mouse - Insectivore	0.065	0	1	0	0.02	3.91E-01	3.01E+01	2.84E+01	5.50E+02	NA	2.81E+02	NA
Di-n-octylphthalate	Deer Mouse - Insectivore	0.065	0	1	0	0.02	1.46E-01	3.51E+01	2.88E+01	1.67E+03	3.54E+03	7.31E+02	1.55E+03
Endosulfan	Deer Mouse - Insectivore	0.065	0	1	0	0.02	5.16E-01	2.88E+01	2.84E+01	1.50E-01	NA	8.01E-02	NA
Endrin	Deer Mouse - Insectivore	0.065	0	1	0	0.02	3.17E-01	3.11E+01	2.85E+01	9.20E-02	NA	4.55E-02	NA
Ethyl acetate	Deer Mouse - Insectivore	0.065	0	1	0	0.02	9.13E-01	2.63E+01	2.85E+01	9.00E+01	NA	5.25E+01	NA
Ethylbenzene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	5.80E-01	2.83E+01	2.84E+01	9.70E+00	NA	5.28E+00	NA
Fluoranthene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	6.03E+00	3.04E+01	3.37E+01	NA	NA	NA	NA
Fluorene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	6.00E-02	2.94E+01	2.80E+01	2.50E+01	NA	1.31E+01	NA
Fluoride	Deer Mouse - Insectivore	0.065	0	1	0	0.02	1.17E+00	2.53E+01	2.86E+01	3.14E+01	NA	1.90E+01	NA
Heptachlor	Deer Mouse - Insectivore	0.065	0	1	0	0.02	2.86E-01	3.16E+01	2.85E+01	1.30E-01	9.40E-01	6.33E-02	4.58E-01
Heptachlor epoxide	Deer Mouse - Insectivore	0.065	0	1	0	0.02	3.96E-01	3.00E+01	2.84E+01	1.25E-01	NA	6.40E-02	NA
Hexachlorobenzene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	2.86E-01	3.16E+01	2.85E+01	2.00E+00	NA	9.74E-01	NA
Hexachlorobutadiene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	3.80E-01	3.02E+01	2.84E+01	2.00E+00	NA	1.02E+00	NA
Hexachlorocyclopentadiene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	3.89E-01	3.01E+01	2.84E+01	1.08E+01	NA	5.52E+00	NA
Hexachloroethane	Deer Mouse - Insectivore	0.065	0	1	0	0.02	4.52E-01	2.94E+01	2.84E+01	7.00E-01	9.90E-01	3.66E-01	5.18E-01
Isophorone	Deer Mouse - Insectivore	0.065	0	1	0	0.02	6.43E-01	2.78E+01	2.84E+01	NA	NA	NA	NA
Isopropylbenzene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	5.22E-01	2.87E+01	2.84E+01	NA	NA	NA	NA
Lindane	Deer Mouse - Insectivore	0.065	0	1	0	0.02	4.26E-01	2.97E+01	2.84E+01	5.00E-02	NA	2.59E-02	NA
Methoxychlor	Deer Mouse - Insectivore	0.065	0	1	0	0.02	3.00E-01	3.13E+01	2.85E+01	2.50E+00	NA	1.23E+00	NA
Methyl Ethyl Ketone	Deer Mouse - Insectivore	0.065	0	1	0	0.02	1.16E+00	2.54E+01	2.86E+01	1.77E+03	NA	1.07E+03	NA
Methyl Methacrylate	Deer Mouse - Insectivore	0.065	0	1	0	0.02	8.99E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Methylene Chloride	Deer Mouse - Insectivore	0.065	0	1	0	0.02	8.86E-01	2.65E+01	2.85E+01	5.85E+00	1.71E+01	3.40E+00	9.94E+00
Methyl-tertbutyl ether	Deer Mouse - Insectivore	0.065	0	1	0	0.02	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Napthalene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	4.19E+00	2.84E+01	3.19E+01	5.00E+01	8.66E+01	2.70E+01	4.68E+01
n-Nitrosodiphenylamine	Deer Mouse - Insectivore	0.065	0	1	0	0.02	8.53E-01	2.66E+01	2.85E+01	5.80E+01	1.16E+02	3.35E+01	6.70E+01
n-Nitrosodipropylamine	Deer Mouse - Insectivore	0.065	0	1	0	0.02	8.88E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	Deer Mouse - Insectivore	0.065	0	1	0	0.02	1.01E+00	2.59E+01	2.85E+01	2.70E+01	NA	1.60E+01	NA
Pendimethalin	Deer Mouse - Insectivore	0.065	0	1	0	0.02	3.71E-01	3.03E+01	2.84E+01	2.50E+00	NA	1.27E+00	NA
Pentachlorobenzene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	3.52E-01	3.06E+01	2.85E+01	8.50E-01	NA	4.28E-01	NA
Pentachloronitrobenzene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	3.52E-01	3.06E+01	2.85E+01	NA	NA	NA	NA
Pentachloronitrobenzene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	3.52E-01	3.06E+01	2.85E+01	2.00E+02	NA	1.01E+02	NA
Pentachlorophenol	Deer Mouse - Insectivore	0.065	0	1	0	0.02	3.73E-01	3.03E+01	2.84E+01	2.40E-01	7.60E-01	1.22E-01	3.86E-01
Phenol	Deer Mouse - Insectivore	0.065	0	1	0	0.02	8.49E-01	2.66E+01	2.85E+01	4.00E+01	NA	2.31E+01	NA
p-Nitrotoluene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	6.86E-01	2.75E+01	2.84E+01	1.10E+02	1.17E+02	6.14E+01	6.55E+01
Pyrene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	3.70E+00	3.04E+01	3.15E+01	NA	NA	NA	NA
Styrene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	6.01E-01	2.81E+01	2.84E+01	3.00E+01	3.46E+01	1.64E+01	1.89E+01
Sulfotep	Deer Mouse - Insectivore	0.065	0	1	0	0.02	4.57E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
Toluene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	6.56E-01	2.77E+01	2.84E+01	2.60E+01	NA	1.44E+01	NA

300

Attachment Table 5
ESL Calculations for Organic ECOIs

			Dietary Proportion				Bioconcentration Factors			Toxicity Reference Values		Ecological Screening Level	
ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Vegetation	Invertebrate	Small Mammal	Soil in Diet	Soil to Plant	Soil to Invertebrate	Soil to Small Mammal	NOAEL (mg/kg day)	Threshold (mg/kg day)	NOAEL (mg/kg)	Threshold (mg/kg)
Toxaphene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	2.26E-01	3.27E+01	2.86E+01	8.00E+00	NA	3.76E+00	NA
trans-1,2-dichloroethene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.55E-01	2.71E+01	2.84E+01	4.52E+01	NA	2.56E+01	NA
Trichloroethene	Deer Mouse - Insectivore	0.065	0	1	0	0.02	6.67E-01	2.77E+01	2.84E+01	7.00E-01	NA	3.89E-01	NA
Trichlorofluoromethane	Deer Mouse - Insectivore	0.065	0	1	0	0.02	7.19E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
Trifluralin	Deer Mouse - Insectivore	0.065	0	1	0	0.02	3.28E-01	3.09E+01	2.85E+01	3.25E+00	NA	1.62E+00	NA
Vinyl acetate	Deer Mouse - Insectivore	0.065	0	1	0	0.02	1.03E+00	2.58E+01	2.85E+01	2.35E+01	NA	1.40E+01	NA
Vinyl Chloride	Deer Mouse - Insectivore	0.065	0	1	0	0.02	8.26E-01	2.67E+01	2.84E+01	1.70E-01	NA	9.77E-02	NA
Xylene (Mixed)	Deer Mouse - Insectivore	0.065	0	1	0	0.02	5.72E-01	2.83E+01	2.84E+01	2.10E+00	2.34E+00	1.14E+00	1.27E+00
1,1,1-Trichloroethane	Mourning Dove - Herbivore	0.23	1	0	0	0.093	6.33E-01	2.79E+01	2.84E+01	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.15E-01	2.74E+01	2.84E+01	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.15E-01	2.74E+01	2.84E+01	NA	NA	NA	NA
1,1,2-Trichloroethane	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.49E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
1,1-Dichloroethane	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.97E-01	2.69E+01	2.84E+01	NA	NA	NA	NA
1,1-Dichloroethene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.29E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
1,2,3-Trichloropropane	Mourning Dove - Herbivore	0.23	1	0	0	0.093	6.62E-01	2.77E+01	2.84E+01	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	3.95E-01	3.00E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trichlorobenzene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	4.63E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trimethylbenzene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	4.99E-01	2.89E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	Mourning Dove - Herbivore	0.23	1	0	0	0.093	5.45E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichloroethane	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.83E-01	2.70E+01	2.84E+01	1.72E+01	NA	8.53E+01	NA
1,2-Dichloroethene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.55E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichloropropane	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.05E-01	2.74E+01	2.84E+01	NA	NA	NA	NA
1,3,5-Trimethylbenzene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	4.99E-01	2.89E+01	2.84E+01	NA	NA	NA	NA
1,3-Dichloropropene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	6.98E-01	2.75E+01	2.84E+01	NA	NA	NA	NA
1,3-Isobenzofurnadione	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.38E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
1,4 Dioxane	Mourning Dove - Herbivore	0.23	1	0	0	0.093	1.34E+00	2.48E+01	2.88E+01	NA	NA	NA	NA
1,4-Dichlorobenzene (-p)	Mourning Dove - Herbivore	0.23	1	0	0	0.093	5.45E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
1-Methyl napthalene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	4.88E-01	2.90E+01	2.84E+01	NA	NA	NA	NA
2,3,4,6 Tetrachlorophenol	Mourning Dove - Herbivore	0.23	1	0	0	0.093	4.45E-01	2.95E+01	2.84E+01	NA	NA	NA	NA
2,4,5-Trichlorophenol	Mourning Dove - Herbivore	0.23	1	0	0	0.093	5.22E-01	2.87E+01	2.84E+01	NA	NA	NA	NA
2,4,5-Trichlorophenoxy Acetic Acid	Mourning Dove - Herbivore	0.23	1	0	0	0.093	5.48E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
2,4,6-Trichlorophenol	Mourning Dove - Herbivore	0.23	1	0	0	0.093	5.22E-01	2.87E+01	2.84E+01	NA	NA	NA	NA
2,4,6-Trinitrotoluene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.53E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
2,4-Dichlorophenol	Mourning Dove - Herbivore	0.23	1	0	0	0.093	6.15E-01	2.80E+01	2.84E+01	NA	NA	NA	NA
2,4-Dinitrophenol	Mourning Dove - Herbivore	0.23	1	0	0	0.093	8.03E-01	2.69E+01	2.84E+01	NA	NA	NA	NA
2,4-Dinitrotoluene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.18E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
2,6-Dinitrotoluene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.18E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
2-Chloronaphthalene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	4.77E-01	2.91E+01	2.84E+01	NA	NA	NA	NA
2-Chlorophenol	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.21E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
2-Methylnaphthalene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	4.88E-01	2.90E+01	2.84E+01	NA	NA	NA	NA
2-Methylphenol	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.40E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
2-Nitroaniline	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.47E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
3,3-Dichlorobenzidine	Mourning Dove - Herbivore	0.23	1	0	0	0.093	5.55E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
4-(2,4-Dichlorophenoxy) Butyric Acid	Mourning Dove - Herbivore	0.23	1	0	0	0.093	5.03E-01	2.89E+01	2.84E+01	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.02E-01	2.74E+01	2.84E+01	NA	NA	NA	NA
4-Chloroaniline	Mourning Dove - Herbivore	0.23	1	0	0	0.093	8.05E-01	2.69E+01	2.84E+01	NA	NA	NA	NA
4-Methyl-2-Pentanone	Mourning Dove - Herbivore	0.23	1	0	0	0.093	9.26E-01	2.63E+01	2.85E+01	NA	NA	NA	NA
4-Nitroanoline	Mourning Dove - Herbivore	0.23	1	0	0	0.093	8.57E-01	2.66E+01	2.85E+01	NA	NA	NA	NA
4-Nitrophenol	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.68E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
Acenaphthene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	4.38E-01	2.95E+01	2.84E+01	NA	NA	NA	NA
Acetone	Mourning Dove - Herbivore	0.23	1	0	0	0.093	1.32E+00	2.49E+01	2.87E+01	NA	NA	NA	NA
Aldrin	Mourning Dove - Herbivore	0.23	1	0	0	0.093	2.29E-01	3.27E+01	2.86E+01	NA	NA	NA	NA
alpha-BHC	Mourning Dove - Herbivore	0.23	1	0	0	0.093	4.26E-01	2.97E+01	2.84E+01	NA	NA	NA	NA
Ammonium (as Ammonia)	Mourning Dove - Herbivore	0.23	1	0	0	0.093	1.17E+00	2.53E+01	2.86E+01	NA	NA	NA	NA
Anthracene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	3.10E+00	2.98E+01	3.09E+01	NA	NA	NA	NA
Benzene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.53E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
Benzo(a)pyrene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	2.00E-01	3.19E+01	2.85E+01	NA	NA	NA	NA
Benzyl alcohol	Mourning Dove - Herbivore	0.23	1	0	0	0.093	9.45E-01	2.62E+01	2.85E+01	NA	NA	NA	NA
Beta-BHC	Mourning Dove - Herbivore	0.23	1	0	0	0.093	4.26E-01	2.97E+01	2.84E+01	NA	NA	NA	NA
BHC (Mixed)	Mourning Dove - Herbivore	0.23	1	0	0	0.093	4.26E-01	2.97E+01	2.84E+01	5.60E-01	NA	4.69E+00	NA
bis(2-chloroethyl)ether	Mourning Dove - Herbivore	0.23	1	0	0	0.093	8.38E-01	2.67E+01	2.84E+01	NA	NA	NA	NA

301

Attachment Table 5
ESL Calculations for Organic ECOIs

ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Dietary Proportion: Vegetation	Invertebrate	Small Mammal	Soil in Diet	Bioconcentration Factors: Soil to Plant	Soil to Invertebrate	Soil to Small Mammal	Toxicity Reference Values: NOAEL (mg/kg day)	Threshold (mg/kg day)	Ecological Screening Level: NOAEL (mg/kg)	Threshold (mg/kg)
bis(2-chloroisopropyl)ether	Mourning Dove - Herbivore	0.23	1	0	0	0.093	6.81E-01	2.76E+01	2.84E+01	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	Mourning Dove - Herbivore	0.23	1	0	0	0.093	1.52E-01	3.49E+01	2.88E+01	1.10E+00	NA	1.95E+01	NA
Bromodichloromethane	Mourning Dove - Herbivore	0.23	1	0	0	0.093	8.28E-01	2.67E+01	2.84E+01	NA	NA	NA	NA
Bromoform	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.91E-01	2.69E+01	2.84E+01	NA	NA	NA	NA
Bromomethane (methyl bromide)	Mourning Dove - Herbivore	0.23	1	0	0	0.093	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Butylbenzylphthalate	Mourning Dove - Herbivore	0.23	1	0	0	0.093	4.04E-01	2.99E+01	2.84E+01	NA	NA	NA	NA
Carbazole	Mourning Dove - Herbivore	0.23	1	0	0	0.093	5.52E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
Carbon disulfide	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.62E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
Carbon Tetrachloride	Mourning Dove - Herbivore	0.23	1	0	0	0.093	6.72E-01	2.76E+01	2.84E+01	NA	NA	NA	NA
Chlordane	Mourning Dove - Herbivore	0.23	1	0	0	0.093	2.58E-01	3.21E+01	2.86E+01	2.14E+00	4.79E+00	2.65E+01	5.92E+01
Chlorobenzene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	6.40E-01	2.78E+01	2.84E+01	NA	NA	NA	NA
Chloroform	Mourning Dove - Herbivore	0.23	1	0	0	0.093	8.47E-01	2.66E+01	2.84E+01	NA	NA	NA	NA
cis-1,2-dichloroethene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.55E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
DDD	Mourning Dove - Herbivore	0.23	1	0	0	0.093	8.00E-02	3.16E+01	2.83E+01	NA	NA	NA	NA
DDE	Mourning Dove - Herbivore	0.23	1	0	0	0.093	6.20E-01	3.27E+01	2.90E+01	6.00E-02	NA	3.66E-01	NA
DDE	Mourning Dove - Herbivore	0.23	1	0	0	0.093	6.20E-01	3.27E+01	2.90E+01	NA	NA	NA	NA
DDT	Mourning Dove - Herbivore	0.23	1	0	0	0.093	8.00E-02	3.24E+01	2.85E+01	9.00E-03	NA	2.26E-01	NA
Dibenzofuran	Mourning Dove - Herbivore	0.23	1	0	0	0.093	4.89E-01	2.90E+01	2.84E+01	NA	NA	NA	NA
Dibromochloromethane	Mourning Dove - Herbivore	0.23	1	0	0	0.093	8.09E-01	2.68E+01	2.84E+01	NA	NA	NA	NA
Dicamba	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.25E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
Dichlorodifluoromethane	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.85E-01	2.70E+01	2.84E+01	NA	NA	NA	NA
Dieldrin	Mourning Dove - Herbivore	0.23	1	0	0	0.093	1.64E+00	3.12E+01	2.97E+01	7.10E-02	NA	1.78E-01	NA
Diethyl Ether	Mourning Dove - Herbivore	0.23	1	0	0	0.093	9.52E-01	2.62E+01	2.85E+01	NA	NA	NA	NA
Diethylphthalate	Mourning Dove - Herbivore	0.23	1	0	0	0.093	6.38E-01	2.78E+01	2.84E+01	NA	NA	NA	NA
Dimethoate	Mourning Dove - Herbivore	0.23	1	0	0	0.093	1.15E+00	2.54E+01	2.86E+01	8.00E-02	NA	2.79E-01	NA
Dimethylphthalate	Mourning Dove - Herbivore	0.23	1	0	0	0.093	8.17E-01	2.68E+01	2.84E+01	NA	NA	NA	NA
Di-n-butyl phthalate	Mourning Dove - Herbivore	0.23	1	0	0	0.093	3.91E-01	3.01E+01	2.84E+01	1.10E-01	NA	9.89E-01	NA
Di-n-octylphthalate	Mourning Dove - Herbivore	0.23	1	0	0	0.093	1.46E-01	3.51E+01	2.88E+01	NA	NA	NA	NA
Endosulfan	Mourning Dove - Herbivore	0.23	1	0	0	0.093	5.16E-01	2.88E+01	2.84E+01	1.00E+01	NA	7.14E+01	NA
Endrin	Mourning Dove - Herbivore	0.23	1	0	0	0.093	3.17E-01	3.11E+01	2.85E+01	1.00E-02	NA	1.06E-01	NA
Ethyl acetate	Mourning Dove - Herbivore	0.23	1	0	0	0.093	9.13E-01	2.63E+01	2.85E+01	NA	NA	NA	NA
Ethylbenzene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	5.80E-01	2.83E+01	2.84E+01	NA	NA	NA	NA
Fluoranthene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	6.03E+00	3.04E+01	3.37E+01	NA	NA	NA	NA
Fluorene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	6.00E-02	2.94E+01	2.80E+01	NA	NA	NA	NA
Fluoride	Mourning Dove - Herbivore	0.23	1	0	0	0.093	1.17E+00	2.53E+01	2.86E+01	7.80E+00	NA	2.68E+01	NA
Heptachlor	Mourning Dove - Herbivore	0.23	1	0	0	0.093	2.86E-01	3.16E+01	2.85E+01	NA	NA	NA	NA
Heptachlor epoxide	Mourning Dove - Herbivore	0.23	1	0	0	0.093	3.96E-01	3.00E+01	2.84E+01	NA	NA	NA	NA
Hexachlorobenzene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	2.86E-01	3.16E+01	2.85E+01	5.63E-02	NA	6.46E-01	NA
Hexachlorobutadiene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	3.80E-01	3.02E+01	2.84E+01	3.00E+00	NA	2.76E+01	NA
Hexachlorocyclopentadiene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	3.89E-01	3.01E+01	2.84E+01	NA	NA	NA	NA
Hexachloroethane	Mourning Dove - Herbivore	0.23	1	0	0	0.093	4.52E-01	2.94E+01	2.84E+01	NA	NA	NA	NA
Isophorone	Mourning Dove - Herbivore	0.23	1	0	0	0.093	6.43E-01	2.78E+01	2.84E+01	NA	NA	NA	NA
Isopropylbenzene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	5.22E-01	2.87E+01	2.84E+01	NA	NA	NA	NA
Lindane	Mourning Dove - Herbivore	0.23	1	0	0	0.093	4.26E-01	2.97E+01	2.84E+01	2.00E+00	NA	1.67E+01	NA
Methoxychlor	Mourning Dove - Herbivore	0.23	1	0	0	0.093	3.00E-01	3.13E+01	2.85E+01	NA	NA	NA	NA
Methyl Ethyl Ketone	Mourning Dove - Herbivore	0.23	1	0	0	0.093	1.16E+00	2.54E+01	2.86E+01	NA	NA	NA	NA
Methyl Methacrylate	Mourning Dove - Herbivore	0.23	1	0	0	0.093	8.99E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Methylene Chloride	Mourning Dove - Herbivore	0.23	1	0	0	0.093	8.86E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Methyl-tertbutyl ether	Mourning Dove - Herbivore	0.23	1	0	0	0.093	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Napthalene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	4.19E+00	2.84E+01	3.19E+01	NA	NA	NA	NA
n-Nitrosodiphenylamine	Mourning Dove - Herbivore	0.23	1	0	0	0.093	8.53E-01	2.66E+01	2.85E+01	NA	NA	NA	NA
n-Nitrosodipropylamine	Mourning Dove - Herbivore	0.23	1	0	0	0.093	8.88E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	Mourning Dove - Herbivore	0.23	1	0	0	0.093	1.01E+00	2.59E+01	2.85E+01	NA	NA	NA	NA
Pendimethalin	Mourning Dove - Herbivore	0.23	1	0	0	0.093	3.71E-01	3.03E+01	2.84E+01	NA	NA	NA	NA
Pentachlorobenzene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	3.52E-01	3.06E+01	2.85E+01	NA	NA	NA	NA
Pentachloronitrobenzene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	3.52E-01	3.06E+01	2.85E+01	7.07E+00	NA	6.91E+01	NA
Pentachloronitrobenzene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	3.52E-01	3.06E+01	2.85E+01	NA	NA	NA	NA
Pentachlorophenol	Mourning Dove - Herbivore	0.23	1	0	0	0.093	3.73E-01	3.03E+01	2.84E+01	NA	NA	NA	NA
Phenol	Mourning Dove - Herbivore	0.23	1	0	0	0.093	8.49E-01	2.66E+01	2.85E+01	NA	NA	NA	NA
p-Nitrotoluene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	6.86E-01	2.75E+01	2.84E+01	NA	NA	NA	NA
Pyrene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	3.70E+00	3.04E+01	3.15E+01	NA	NA	NA	NA

302

Attachment Table 5
ESL Calculations for Organic ECOIs

ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Dietary Proportion: Vegetation	Dietary Proportion: Invertebrate	Dietary Proportion: Small Mammal	Dietary Proportion: Soil in Diet	Bioconcentration Factors: Soil to Plant	Bioconcentration Factors: Soil to Invertebrate	Bioconcentration Factors: Soil to Small Mammal	Toxicity Reference Values: NOAEL (mg/kg day)	Toxicity Reference Values: Threshold (mg/kg day)	Ecological Screening Level: NOAEL (mg/kg)	Ecological Screening Level: Threshold (mg/kg)
Styrene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	6.01E-01	2.81E+01	2.84E+01	NA	NA	NA	NA
Sulfotep	Mourning Dove - Herbivore	0.23	1	0	0	0.093	4.57E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
Toluene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	6.56E-01	2.77E+01	2.84E+01	NA	NA	NA	NA
Toxaphene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	2.26E-01	3.27E+01	2.86E+01	NA	NA	NA	NA
trans-1,2-dichloroethene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.55E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
Trichloroethene	Mourning Dove - Herbivore	0.23	1	0	0	0.093	6.67E-01	2.77E+01	2.84E+01	NA	NA	NA	NA
Trichlorofluoromethane	Mourning Dove - Herbivore	0.23	1	0	0	0.093	7.19E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
Trifluralin	Mourning Dove - Herbivore	0.23	1	0	0	0.093	3.28E-01	3.09E+01	2.85E+01	NA	NA	NA	NA
Vinyl acetate	Mourning Dove - Herbivore	0.23	1	0	0	0.093	1.03E+00	2.58E+01	2.85E+01	NA	NA	NA	NA
Vinyl Chloride	Mourning Dove - Herbivore	0.23	1	0	0	0.093	8.26E-01	2.67E+01	2.84E+01	NA	NA	NA	NA
Xylene (Mixed)	Mourning Dove - Herbivore	0.23	1	0	0	0.093	5.72E-01	2.83E+01	2.84E+01	NA	NA	NA	NA
1,1,1-Trichloroethane	Mourning Dove - Insectivore	0.23	0	1	0	0.093	6.33E-01	2.79E+01	2.84E+01	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.15E-01	2.74E+01	2.84E+01	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.15E-01	2.74E+01	2.84E+01	NA	NA	NA	NA
1,1,2-Trichloroethane	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.49E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
1,1-Dichloroethane	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.97E-01	2.69E+01	2.84E+01	NA	NA	NA	NA
1,1-Dichloroethene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.29E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
1,2,3-Trichloropropane	Mourning Dove - Insectivore	0.23	0	1	0	0.093	6.62E-01	2.77E+01	2.84E+01	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	3.95E-01	3.00E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trichlorobenzene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	4.63E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trimethylbenzene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	4.99E-01	2.89E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	Mourning Dove - Insectivore	0.23	0	1	0	0.093	5.45E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichloroethane	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.83E-01	2.70E+01	2.84E+01	1.72E+01	NA	2.76E+00	NA
1,2-Dichloroethene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.55E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichloropropane	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.05E-01	2.74E+01	2.84E+01	NA	NA	NA	NA
1,3,5-Trimethylbenzene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	4.99E-01	2.89E+01	2.84E+01	NA	NA	NA	NA
1,3-Dichloropropene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	6.98E-01	2.75E+01	2.84E+01	NA	NA	NA	NA
1,3-Isobenzofurnadione	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.38E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
1,4 Dioxane	Mourning Dove - Insectivore	0.23	0	1	0	0.093	1.34E+00	2.48E+01	2.88E+01	NA	NA	NA	NA
1,4-Dichlorobenzene (-p)	Mourning Dove - Insectivore	0.23	0	1	0	0.093	5.45E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
1-Methyl napthalene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	4.88E-01	2.90E+01	2.84E+01	NA	NA	NA	NA
2,3,4,6 Tetrachlorophenol	Mourning Dove - Insectivore	0.23	0	1	0	0.093	4.45E-01	2.95E+01	2.84E+01	NA	NA	NA	NA
2,4,5-Trichlorophenol	Mourning Dove - Insectivore	0.23	0	1	0	0.093	5.22E-01	2.87E+01	2.84E+01	NA	NA	NA	NA
2,4,5-Trichlorophenoxy Acetic Acid	Mourning Dove - Insectivore	0.23	0	1	0	0.093	5.48E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
2,4,6-Trichlorophenol	Mourning Dove - Insectivore	0.23	0	1	0	0.093	5.22E-01	2.87E+01	2.84E+01	NA	NA	NA	NA
2,4,6-Trinitrotoluene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.53E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
2,4-Dichlorophenol	Mourning Dove - Insectivore	0.23	0	1	0	0.093	6.15E-01	2.80E+01	2.84E+01	NA	NA	NA	NA
2,4-Dinitrophenol	Mourning Dove - Insectivore	0.23	0	1	0	0.093	8.03E-01	2.69E+01	2.84E+01	NA	NA	NA	NA
2,4-Dinitrotoluene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.18E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
2,6-Dinitrotoluene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.18E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
2-Chloronaphthalene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	4.77E-01	2.91E+01	2.84E+01	NA	NA	NA	NA
2-Chlorophenol	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.21E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
2-Methylnaphthalene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	4.88E-01	2.90E+01	2.84E+01	NA	NA	NA	NA
2-Methylphenol	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.40E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
2-Nitroaniline	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.47E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
3,3-Dichlorobenzidine	Mourning Dove - Insectivore	0.23	0	1	0	0.093	5.55E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
4-(2,4-Dichlorophenoxy) Butyric Acid	Mourning Dove - Insectivore	0.23	0	1	0	0.093	5.03E-01	2.89E+01	2.84E+01	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.02E-01	2.74E+01	2.84E+01	NA	NA	NA	NA
4-Chloroaniline	Mourning Dove - Insectivore	0.23	0	1	0	0.093	8.05E-01	2.69E+01	2.84E+01	NA	NA	NA	NA
4-Methyl-2-Pentanone	Mourning Dove - Insectivore	0.23	0	1	0	0.093	9.26E-01	2.63E+01	2.85E+01	NA	NA	NA	NA
4-Nitroanoline	Mourning Dove - Insectivore	0.23	0	1	0	0.093	8.57E-01	2.66E+01	2.85E+01	NA	NA	NA	NA
4-Nitrophenol	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.68E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
Acenaphthene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	4.38E-01	2.95E+01	2.84E+01	NA	NA	NA	NA
Acetone	Mourning Dove - Insectivore	0.23	0	1	0	0.093	1.32E+00	2.49E+01	2.87E+01	NA	NA	NA	NA
Aldrin	Mourning Dove - Insectivore	0.23	0	1	0	0.093	2.29E-01	3.27E+01	2.86E+01	NA	NA	NA	NA
alpha-BHC	Mourning Dove - Insectivore	0.23	0	1	0	0.093	4.26E-01	2.97E+01	2.84E+01	NA	NA	NA	NA
Ammonium (as Ammonia)	Mourning Dove - Insectivore	0.23	0	1	0	0.093	1.17E+00	2.53E+01	2.86E+01	NA	NA	NA	NA
Anthracene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	3.10E+00	2.98E+01	3.09E+01	NA	NA	NA	NA
Benzene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.53E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
Benzo(a)pyrene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	2.00E-01	3.19E+01	2.85E+01	NA	NA	NA	NA
Benzyl alcohol	Mourning Dove - Insectivore	0.23	0	1	0	0.093	9.45E-01	2.62E+01	2.85E+01	NA	NA	NA	NA

303

Attachment Table 5
ESL Calculations for Organic ECOIs

ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Dietary Proportion: Vegetation	Dietary Proportion: Invertebrate	Dietary Proportion: Small Mammal	Dietary Proportion: Soil in Diet	Bioconcentration Factors: Soil to Plant	Bioconcentration Factors: Soil to Invertebrate	Bioconcentration Factors: Soil to Small Mammal	Toxicity Reference Values: NOAEL (mg/kg day)	Toxicity Reference Values: Threshold (mg/kg day)	Ecological Screening Level: NOAEL (mg/kg)	Ecological Screening Level: Threshold (mg/kg)
Beta-BHC	Mourning Dove - Insectivore	0.23	0	1	0	0.093	4.26E-01	2.97E+01	2.84E+01	NA	NA	NA	NA
BHC (Mixed)	Mourning Dove - Insectivore	0.23	0	1	0	0.093	4.26E-01	2.97E+01	2.84E+01	5.60E-01	NA	8.18E-02	NA
bis(2-chloroethyl)ether	Mourning Dove - Insectivore	0.23	0	1	0	0.093	8.38E-01	2.67E+01	2.84E+01	NA	NA	NA	NA
bis(2-chloroisopropyl)ether	Mourning Dove - Insectivore	0.23	0	1	0	0.093	6.81E-01	2.76E+01	2.84E+01	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	Mourning Dove - Insectivore	0.23	0	1	0	0.093	1.52E-01	3.49E+01	2.88E+01	1.10E+00	NA	1.37E-01	NA
Bromodichloromethane	Mourning Dove - Insectivore	0.23	0	1	0	0.093	8.28E-01	2.67E+01	2.84E+01	NA	NA	NA	NA
Bromoform	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.91E-01	2.69E+01	2.84E+01	NA	NA	NA	NA
Bromomethane (methyl bromide)	Mourning Dove - Insectivore	0.23	0	1	0	0.093	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Butylbenzylphthalate	Mourning Dove - Insectivore	0.23	0	1	0	0.093	4.04E-01	2.99E+01	2.84E+01	NA	NA	NA	NA
Carbazole	Mourning Dove - Insectivore	0.23	0	1	0	0.093	5.52E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
Carbon disulfide	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.62E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
Carbon Tetrachloride	Mourning Dove - Insectivore	0.23	0	1	0	0.093	6.72E-01	2.76E+01	2.84E+01	NA	NA	NA	NA
Chlordane	Mourning Dove - Insectivore	0.23	0	1	0	0.093	2.58E-01	3.21E+01	2.86E+01	2.14E+00	4.79E+00	2.89E-01	6.47E-01
Chlorobenzene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	6.40E-01	2.78E+01	2.84E+01	NA	NA	NA	NA
Chloroform	Mourning Dove - Insectivore	0.23	0	1	0	0.093	8.47E-01	2.66E+01	2.84E+01	NA	NA	NA	NA
cis-1,2-dichloroethene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.55E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
DDD	Mourning Dove - Insectivore	0.23	0	1	0	0.093	8.00E-02	3.16E+01	2.83E+01	NA	NA	NA	NA
DDE	Mourning Dove - Insectivore	0.23	0	1	0	0.093	6.20E-01	3.27E+01	2.90E+01	6.00E-02	NA	7.95E-03	NA
DDE	Mourning Dove - Insectivore	0.23	0	1	0	0.093	6.20E-01	3.27E+01	2.90E+01	NA	NA	NA	NA
DDT	Mourning Dove - Insectivore	0.23	0	1	0	0.093	8.00E-02	3.24E+01	2.85E+01	9.00E-03	NA	1.20E-03	NA
Dibenzofuran	Mourning Dove - Insectivore	0.23	0	1	0	0.093	4.89E-01	2.90E+01	2.84E+01	NA	NA	NA	NA
Dibromochloromethane	Mourning Dove - Insectivore	0.23	0	1	0	0.093	8.09E-01	2.68E+01	2.84E+01	NA	NA	NA	NA
Dicamba	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.25E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
Dichlorodifluoromethane	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.85E-01	2.70E+01	2.84E+01	NA	NA	NA	NA
Dieldrin	Mourning Dove - Insectivore	0.23	0	1	0	0.093	1.64E+00	3.12E+01	2.97E+01	7.10E-02	NA	9.87E-03	NA
Diethyl Ether	Mourning Dove - Insectivore	0.23	0	1	0	0.093	9.52E-01	2.62E+01	2.85E+01	NA	NA	NA	NA
Diethylphthalate	Mourning Dove - Insectivore	0.23	0	1	0	0.093	6.38E-01	2.78E+01	2.84E+01	NA	NA	NA	NA
Dimethoate	Mourning Dove - Insectivore	0.23	0	1	0	0.093	1.15E+00	2.54E+01	2.86E+01	8.00E-02	NA	1.37E-02	NA
Dimethylphthalate	Mourning Dove - Insectivore	0.23	0	1	0	0.093	8.17E-01	2.68E+01	2.84E+01	NA	NA	NA	NA
Di-n-butyl phthalate	Mourning Dove - Insectivore	0.23	0	1	0	0.093	3.91E-01	3.01E+01	2.84E+01	1.10E-01	NA	1.59E-02	NA
Di-n-octylphthalate	Mourning Dove - Insectivore	0.23	0	1	0	0.093	1.46E-01	3.51E+01	2.88E+01	NA	NA	NA	NA
Endosulfan	Mourning Dove - Insectivore	0.23	0	1	0	0.093	5.16E-01	2.88E+01	2.84E+01	1.00E+01	NA	1.51E+00	NA
Endrin	Mourning Dove - Insectivore	0.23	0	1	0	0.093	3.17E-01	3.11E+01	2.85E+01	1.00E-02	NA	1.40E-03	NA
Ethyl acetate	Mourning Dove - Insectivore	0.23	0	1	0	0.093	9.13E-01	2.63E+01	2.85E+01	NA	NA	NA	NA
Ethylbenzene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	5.80E-01	2.83E+01	2.84E+01	NA	NA	NA	NA
Fluoranthene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	6.03E+00	3.04E+01	3.37E+01	NA	NA	NA	NA
Fluorene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	6.00E-02	2.94E+01	2.80E+01	NA	NA	NA	NA
Fluoride	Mourning Dove - Insectivore	0.23	0	1	0	0.093	1.17E+00	2.53E+01	2.86E+01	7.80E+00	NA	1.33E+00	NA
Heptachlor	Mourning Dove - Insectivore	0.23	0	1	0	0.093	2.86E-01	3.16E+01	2.85E+01	NA	NA	NA	NA
Heptachlor epoxide	Mourning Dove - Insectivore	0.23	0	1	0	0.093	3.96E-01	3.00E+01	2.84E+01	NA	NA	NA	NA
Hexachlorobenzene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	2.86E-01	3.16E+01	2.85E+01	5.63E-02	NA	7.73E-03	NA
Hexachlorobutadiene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	3.80E-01	3.02E+01	2.84E+01	3.00E+00	NA	4.31E-01	NA
Hexachlorocyclopentadiene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	3.89E-01	3.01E+01	2.84E+01	NA	NA	NA	NA
Hexachloroethane	Mourning Dove - Insectivore	0.23	0	1	0	0.093	4.52E-01	2.94E+01	2.84E+01	NA	NA	NA	NA
Isophorone	Mourning Dove - Insectivore	0.23	0	1	0	0.093	6.43E-01	2.78E+01	2.84E+01	NA	NA	NA	NA
Isopropylbenzene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	5.22E-01	2.87E+01	2.84E+01	NA	NA	NA	NA
Lindane	Mourning Dove - Insectivore	0.23	0	1	0	0.093	4.26E-01	2.97E+01	2.84E+01	2.00E+00	NA	2.92E-01	NA
Methoxychlor	Mourning Dove - Insectivore	0.23	0	1	0	0.093	3.00E-01	3.13E+01	2.85E+01	NA	NA	NA	NA
Methyl Ethyl Ketone	Mourning Dove - Insectivore	0.23	0	1	0	0.093	1.16E+00	2.54E+01	2.86E+01	NA	NA	NA	NA
Methyl Methacrylate	Mourning Dove - Insectivore	0.23	0	1	0	0.093	8.99E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Methylene Chloride	Mourning Dove - Insectivore	0.23	0	1	0	0.093	8.86E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Methyl-tertbutyl ether	Mourning Dove - Insectivore	0.23	0	1	0	0.093	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Napthalene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	4.19E+00	2.84E+01	3.19E+01	NA	NA	NA	NA
n-Nitrosodiphenylamine	Mourning Dove - Insectivore	0.23	0	1	0	0.093	8.53E-01	2.66E+01	2.85E+01	NA	NA	NA	NA
n-Nitrosodipropylamine	Mourning Dove - Insectivore	0.23	0	1	0	0.093	8.88E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	Mourning Dove - Insectivore	0.23	0	1	0	0.093	1.01E+00	2.59E+01	2.85E+01	NA	NA	NA	NA
Pendimethalin	Mourning Dove - Insectivore	0.23	0	1	0	0.093	3.71E-01	3.03E+01	2.84E+01	NA	NA	NA	NA
Pentachlorobenzene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	3.52E-01	3.06E+01	2.85E+01	NA	NA	NA	NA
Pentachloronitrobenzene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	3.52E-01	3.06E+01	2.85E+01	7.07E+00	NA	1.00E+00	NA
Pentachloronitrobenzene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	3.52E-01	3.06E+01	2.85E+01	NA	NA	NA	NA
Pentachlorophenol	Mourning Dove - Insectivore	0.23	0	1	0	0.093	3.73E-01	3.03E+01	2.84E+01	NA	NA	NA	NA

Attachment Table 5
ESL Calculations for Organic ECOIs

			Dietary Proportion				Bioconcentration Factors			Toxicity Reference Values		Ecological Screening Level	
ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Vegetation	Invertebrate	Small Mammal	Soil in Diet	Soil to Plant	Soil to Invertebrate	Soil to Small Mammal	NOAEL (mg/kg day)	Threshold (mg/kg day)	NOAEL (mg/kg)	Threshold (mg/kg)
Phenol	Mourning Dove - Insectivore	0.23	0	1	0	0.093	8.49E-01	2.66E+01	2.85E+01	NA	NA	NA	NA
p-Nitrotoluene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	6.86E-01	2.75E+01	2.84E+01	NA	NA	NA	NA
Pyrene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	3.70E+00	3.04E+01	3.15E+01	NA	NA	NA	NA
Styrene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	6.01E-01	2.81E+01	2.84E+01	NA	NA	NA	NA
Sulfotep	Mourning Dove - Insectivore	0.23	0	1	0	0.093	4.57E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
Toluene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	6.56E-01	2.77E+01	2.84E+01	NA	NA	NA	NA
Toxaphene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	2.26E-01	3.27E+01	2.86E+01	NA	NA	NA	NA
trans-1,2-dichloroethene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.55E-01	2.71E+01	2.84E+01	NA	NA	NA	NA
Trichloroethene	Mourning Dove - Insectivore	0.23	0	1	0	0.093	6.67E-01	2.77E+01	2.84E+01	NA	NA	NA	NA
Trichlorofluoromethane	Mourning Dove - Insectivore	0.23	0	1	0	0.093	7.19E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
Trifluralin	Mourning Dove - Insectivore	0.23	0	1	0	0.093	3.28E-01	3.09E+01	2.85E+01	NA	NA	NA	NA
Vinyl acetate	Mourning Dove - Insectivore	0.23	0	1	0	0.093	1.03E+00	2.58E+01	2.85E+01	NA	NA	NA	NA
Vinyl Chloride	Mourning Dove - Insectivore	0.23	0	1	0	0.093	8.26E-01	2.67E+01	2.84E+01	NA	NA	NA	NA
Xylene (Mixed)	Mourning Dove - Insectivore	0.23	0	1	0	0.093	5.72E-01	2.83E+01	2.84E+01	NA	NA	NA	NA
1,1,1-Trichloroethane	Mule Deer	0.022	1	0	0	0.017	6.33E-01	2.79E+01	2.84E+01	1.00E+03	NA	6.99E+04	NA
1,1,2,2-Tetrachloroethane	Mule Deer	0.022	1	0	0	0.017	7.15E-01	2.74E+01	2.84E+01	1.08E+02	NA	6.70E+03	NA
1,1,2-Trichloroethane	Mule Deer	0.022	1	0	0	0.017	7.49E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
1,1-Dichloroethane	Mule Deer	0.022	1	0	0	0.017	7.97E-01	2.69E+01	2.84E+01	5.46E+00	NA	3.05E+02	NA
1,1-Dichloroethene	Mule Deer	0.022	1	0	0	0.017	7.29E-01	2.73E+01	2.84E+01	3.00E+01	NA	1.83E+03	NA
1,2,3-Trichloropropane	Mule Deer	0.022	1	0	0	0.017	6.62E-01	2.77E+01	2.84E+01	2.50E+01	NA	1.67E+03	NA
1,2,4,5-Tetrachlorobenzene	Mule Deer	0.022	1	0	0	0.017	3.95E-01	3.00E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trichlorobenzene	Mule Deer	0.022	1	0	0	0.017	4.63E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trimethylbenzene	Mule Deer	0.022	1	0	0	0.017	4.99E-01	2.89E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	Mule Deer	0.022	1	0	0	0.017	5.45E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichloroethane	Mule Deer	0.022	1	0	0	0.017	7.83E-01	2.70E+01	2.84E+01	5.00E+01	NA	2.84E+03	NA
1,2-Dichloroethene	Mule Deer	0.022	1	0	0	0.017	7.55E-01	2.71E+01	2.84E+01	4.52E+01	NA	2.66E+03	NA
1,2-Dichloropropane	Mule Deer	0.022	1	0	0	0.017	7.05E-01	2.74E+01	2.84E+01	8.90E+01	1.26E+02	5.60E+03	7.94E+03
1,3,5-Trimethylbenzene	Mule Deer	0.022	1	0	0	0.017	4.99E-01	2.89E+01	2.84E+01	1.43E+01	NA	1.26E+03	NA
1,3-Dichloropropene	Mule Deer	0.022	1	0	0	0.017	6.98E-01	2.75E+01	2.84E+01	5.00E+00	8.66E+00	3.18E+02	5.50E+02
1,3-Isobenzofurnadione	Mule Deer	0.022	1	0	0	0.017	7.38E-01	2.72E+01	2.84E+01	7.57E+02	NA	4.56E+04	NA
1,4 Dioxane	Mule Deer	0.022	1	0	0	0.017	1.34E+00	2.48E+01	2.88E+01	2.96E+01	NA	9.90E+02	NA
1,4-Dichlorobenzene (-p)	Mule Deer	0.022	1	0	0	0.017	5.45E-01	2.85E+01	2.84E+01	1.07E+02	1.51E+02	8.65E+03	1.22E+04
1-Methyl napthalene	Mule Deer	0.022	1	0	0	0.017	4.88E-01	2.90E+01	2.84E+01	1.40E+01	NA	1.26E+03	NA
2,3,4,6 Tetrachlorophenol	Mule Deer	0.022	1	0	0	0.017	4.45E-01	2.95E+01	2.84E+01	1.00E+01	NA	9.84E+02	NA
2,4,5-Trichlorophenol	Mule Deer	0.022	1	0	0	0.017	5.22E-01	2.87E+01	2.84E+01	1.00E+01	1.73E+01	8.43E+02	1.46E+03
2,4,5-Trichlorophenoxy Acetic Acid	Mule Deer	0.022	1	0	0	0.017	5.48E-01	2.85E+01	2.84E+01	3.00E-01	5.50E-01	2.41E+01	4.43E+01
2,4,6-Trichlorophenol	Mule Deer	0.022	1	0	0	0.017	5.22E-01	2.87E+01	2.84E+01	3.00E-01	NA	2.53E+01	NA
2,4,6-Trinitrotoluene	Mule Deer	0.022	1	0	0	0.017	7.53E-01	2.71E+01	2.84E+01	5.00E-01	1.18E+00	2.95E+01	6.97E+01
2,4-Dichlorophenol	Mule Deer	0.022	1	0	0	0.017	6.15E-01	2.80E+01	2.84E+01	5.00E+00	NA	3.60E+02	NA
2,4-Dinitrophenol	Mule Deer	0.022	1	0	0	0.017	8.03E-01	2.69E+01	2.84E+01	1.25E+02	2.09E+02	6.93E+03	1.16E+04
2,4-Dinitrotoluene	Mule Deer	0.022	1	0	0	0.017	7.18E-01	2.73E+01	2.84E+01	5.70E-02	NA	NA	NA
2,6-Dinitrotoluene	Mule Deer	0.022	1	0	0	0.017	7.18E-01	2.73E+01	2.84E+01	1.10E+01	1.96E+01	6.81E+02	1.21E+03
2-Chloronaphthalene	Mule Deer	0.022	1	0	0	0.017	4.77E-01	2.91E+01	2.84E+01	NA	NA	NA	NA
2-Chlorophenol	Mule Deer	0.022	1	0	0	0.017	7.21E-01	2.73E+01	2.84E+01	5.00E-01	NA	3.08E+01	NA
2-Methylnaphthalene	Mule Deer	0.022	1	0	0	0.017	4.88E-01	2.90E+01	2.84E+01	5.23E+00	7.61E+00	4.71E+02	6.85E+02
2-Methylphenol	Mule Deer	0.022	1	0	0	0.017	7.40E-01	2.72E+01	2.84E+01	2.19E+02	NA	1.32E+04	NA
2-Nitroaniline	Mule Deer	0.022	1	0	0	0.017	7.47E-01	2.72E+01	2.84E+01	1.00E+01	NA	5.95E+02	NA
3,3-Dichlorobenzidine	Mule Deer	0.022	1	0	0	0.017	5.55E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
4-(2,4-Dichlorophenoxy) Butyric Acid	Mule Deer	0.022	1	0	0	0.017	5.03E-01	2.89E+01	2.84E+01	8.00E-01	NA	6.99E+01	NA
4,6-Dinitro-2-methylphenol	Mule Deer	0.022	1	0	0	0.017	7.02E-01	2.74E+01	2.84E+01	1.00E+00	NA	6.32E+01	NA
4-Chloroaniline	Mule Deer	0.022	1	0	0	0.017	8.05E-01	2.69E+01	2.84E+01	1.25E+00	NA	6.91E+01	NA
4-Methyl-2-Pentanone	Mule Deer	0.022	1	0	0	0.017	9.26E-01	2.63E+01	2.85E+01	2.50E+01	NA	1.20E+03	NA
4-Nitroanoline	Mule Deer	0.022	1	0	0	0.017	8.57E-01	2.66E+01	2.85E+01	7.10E+01	NA	3.69E+03	NA
4-Nitrophenol	Mule Deer	0.022	1	0	0	0.017	7.68E-01	2.71E+01	2.84E+01	2.50E+01	NA	1.45E+03	NA
Acenaphthene	Mule Deer	0.022	1	0	0	0.017	4.38E-01	2.95E+01	2.84E+01	NA	NA	NA	NA
Acetone	Mule Deer	0.022	1	0	0	0.017	1.32E+00	2.49E+01	2.87E+01	1.00E+01	2.24E+01	3.41E+02	7.63E+02
Aldrin	Mule Deer	0.022	1	0	0	0.017	2.29E-01	3.27E+01	2.86E+01	1.00E-01	NA	1.85E+01	NA
alpha-BHC	Mule Deer	0.022	1	0	0	0.017	4.26E-01	2.97E+01	2.84E+01	3.60E+01	NA	3.69E+03	NA
Ammonium (as Ammonia)	Mule Deer	0.022	1	0	0	0.017	1.17E+00	2.53E+01	2.86E+01	9.66E+02	NA	3.70E+04	NA
Anthracene	Mule Deer	0.022	1	0	0	0.017	3.10E+00	2.98E+01	3.09E+01	NA	NA	NA	NA
Benzene	Mule Deer	0.022	1	0	0	0.017	7.53E-01	2.71E+01	2.84E+01	2.64E+01	NA	1.56E+03	NA

Attachment Table 5
ESL Calculations for Organic ECOIs

ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Dietary Proportion: Vegetation	Dietary Proportion: Invertebrate	Dietary Proportion: Small Mammal	Dietary Proportion: Soil in Diet	Bioconcentration Factors: Soil to Plant	Bioconcentration Factors: Soil to Invertebrate	Bioconcentration Factors: Soil to Small Mammal	Toxicity Reference Values: NOAEL (mg/kg day)	Toxicity Reference Values: Threshold (mg/kg day)	Ecological Screening Level: NOAEL (mg/kg)	Ecological Screening Level: Threshold (mg/kg)
Benzo(a)pyrene	Mule Deer	0.022	1	0	0	0.017	2.00E-01	3.19E+01	2.85E+01	1.31E+00	6.55E+00	2.74E+02	1.37E+03
Benzyl alcohol	Mule Deer	0.022	1	0	0	0.017	9.45E-01	2.62E+01	2.85E+01	7.50E+00	NA	3.54E+02	NA
Beta-BHC	Mule Deer	0.022	1	0	0	0.017	4.26E-01	2.97E+01	2.84E+01	4.00E-01	8.94E-01	4.10E+01	9.17E+01
BHC (Mixed)	Mule Deer	0.022	1	0	0	0.017	4.26E-01	2.97E+01	2.84E+01	1.60E+00	2.26E+00	1.64E+02	2.32E+02
bis(2-chloroethyl)ether	Mule Deer	0.022	1	0	0	0.017	8.38E-01	2.67E+01	2.84E+01	NA	NA	NA	NA
bis(2-chloroisopropyl)ether	Mule Deer	0.022	1	0	0	0.017	6.81E-01	2.76E+01	2.84E+01	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	Mule Deer	0.022	1	0	0	0.017	1.52E-01	3.49E+01	2.88E+01	1.83E+01	NA	4.93E+03	NA
Bromodichloromethane	Mule Deer	0.022	1	0	0	0.017	8.28E-01	2.67E+01	2.84E+01	1.00E+01	1.41E+01	5.38E+02	7.59E+02
Bromoform	Mule Deer	0.022	1	0	0	0.017	7.91E-01	2.69E+01	2.84E+01	5.00E+00	NA	2.81E+02	NA
Bromomethane (methyl bromide)	Mule Deer	0.022	1	0	0	0.017	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Butylbenzylphthalate	Mule Deer	0.022	1	0	0	0.017	4.04E-01	2.99E+01	2.84E+01	4.70E+01	8.16E+01	5.08E+03	8.82E+03
Carbazole	Mule Deer	0.022	1	0	0	0.017	5.52E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
Carbon disulfide	Mule Deer	0.022	1	0	0	0.017	7.62E-01	2.71E+01	2.84E+01	1.00E+01	NA	5.83E+02	NA
Carbon Tetrachloride	Mule Deer	0.022	1	0	0	0.017	6.72E-01	2.76E+01	2.84E+01	1.60E+01	NA	1.05E+03	NA
Chlordane	Mule Deer	0.022	1	0	0	0.017	2.58E-01	3.21E+01	2.86E+01	4.60E+00	NA	7.59E+02	NA
Chlorobenzene	Mule Deer	0.022	1	0	0	0.017	6.40E-01	2.78E+01	2.84E+01	8.60E+00	1.22E+01	5.95E+02	8.45E+02
Chloroform	Mule Deer	0.022	1	0	0	0.017	8.47E-01	2.66E+01	2.84E+01	1.50E+01	2.48E+01	7.90E+02	1.31E+03
cis-1,2-dichloroethene	Mule Deer	0.022	1	0	0	0.017	7.55E-01	2.71E+01	2.84E+01	3.20E+00	NA	1.89E+02	NA
DDD	Mule Deer	0.022	1	0	0	0.017	8.00E-02	3.16E+01	2.83E+01	2.82E+01	NA	1.32E+04	NA
DDE	Mule Deer	0.022	1	0	0	0.017	6.20E-01	3.27E+01	2.90E+01	1.10E+00	NA	7.85E+01	NA
DDT	Mule Deer	0.022	1	0	0	0.017	8.00E-02	3.24E+01	2.85E+01	8.00E-01	3.58E+00	3.75E+02	1.68E+03
Dibenzofuran	Mule Deer	0.022	1	0	0	0.017	4.89E-01	2.90E+01	2.84E+01	4.00E+01	NA	NA	3.59E+03
Dibromochloromethane	Mule Deer	0.022	1	0	0	0.017	8.09E-01	2.68E+01	2.84E+01	1.00E+01	NA	5.50E+02	NA
Dicamba	Mule Deer	0.022	1	0	0	0.017	7.25E-01	2.73E+01	2.84E+01	3.00E+00	NA	1.84E+02	NA
Dichlorodifluoromethane	Mule Deer	0.022	1	0	0	0.017	7.85E-01	2.70E+01	2.84E+01	1.50E+00	NA	8.50E+01	NA
Dieldrin	Mule Deer	0.022	1	0	0	0.017	1.64E+00	3.12E+01	2.97E+01	1.50E-02	2.12E-02	4.11E-01	5.82E-01
Diethyl Ether	Mule Deer	0.022	1	0	0	0.017	9.52E-01	2.62E+01	2.85E+01	5.00E+01	NA	2.34E+03	NA
Diethylphthalate	Mule Deer	0.022	1	0	0	0.017	6.38E-01	2.78E+01	2.84E+01	4.58E+03	NA	3.18E+05	NA
Dimethoate	Mule Deer	0.022	1	0	0	0.017	1.15E+00	2.54E+01	2.86E+01	NA	NA	NA	NA
Dimethylphthalate	Mule Deer	0.022	1	0	0	0.017	8.17E-01	2.68E+01	2.84E+01	3.50E+02	NA	1.91E+04	NA
Di-n-butyl phthalate	Mule Deer	0.022	1	0	0	0.017	3.91E-01	3.01E+01	2.84E+01	5.50E+02	NA	6.13E+04	NA
Di-n-octylphthalate	Mule Deer	0.022	1	0	0	0.017	1.46E-01	3.51E+01	2.88E+01	1.67E+03	3.54E+03	4.65E+05	9.86E+05
Endosulfan	Mule Deer	0.022	1	0	0	0.017	5.16E-01	2.88E+01	2.84E+01	1.50E-01	NA	1.28E+01	NA
Endrin	Mule Deer	0.022	1	0	0	0.017	3.17E-01	3.11E+01	2.85E+01	9.20E-02	NA	1.25E+01	NA
Ethyl acetate	Mule Deer	0.022	1	0	0	0.017	9.13E-01	2.63E+01	2.85E+01	9.00E+01	NA	4.40E+03	NA
Ethylbenzene	Mule Deer	0.022	1	0	0	0.017	5.80E-01	2.83E+01	2.84E+01	9.70E+00	NA	7.38E+02	NA
Fluoranthene	Mule Deer	0.022	1	0	0	0.017	6.03E+00	3.04E+01	3.37E+01	NA	NA	NA	NA
Fluorene	Mule Deer	0.022	1	0	0	0.017	6.00E-02	2.94E+01	2.80E+01	2.50E+01	NA	1.48E+04	NA
Fluoride	Mule Deer	0.022	1	0	0	0.017	1.17E+00	2.53E+01	2.86E+01	3.14E+01	NA	1.20E+03	NA
Heptachlor	Mule Deer	0.022	1	0	0	0.017	2.86E-01	3.16E+01	2.85E+01	1.30E-01	9.40E-01	1.95E+01	1.41E+02
Heptachlor epoxide	Mule Deer	0.022	1	0	0	0.017	3.96E-01	3.00E+01	2.84E+01	1.25E-01	NA	1.38E+01	NA
Hexachlorobenzene	Mule Deer	0.022	1	0	0	0.017	2.86E-01	3.16E+01	2.85E+01	2.00E+00	NA	3.00E+02	NA
Hexachlorobutadiene	Mule Deer	0.022	1	0	0	0.017	3.80E-01	3.02E+01	2.84E+01	2.00E+00	NA	2.29E+02	NA
Hexachlorocyclopentadiene	Mule Deer	0.022	1	0	0	0.017	3.89E-01	3.01E+01	2.84E+01	1.08E+01	NA	1.21E+03	NA
Hexachloroethane	Mule Deer	0.022	1	0	0	0.017	4.52E-01	2.94E+01	2.84E+01	7.00E-01	9.90E-01	6.79E+01	9.60E+01
Isophorone	Mule Deer	0.022	1	0	0	0.017	6.43E-01	2.78E+01	2.84E+01	NA	NA	NA	NA
Isopropylbenzene	Mule Deer	0.022	1	0	0	0.017	5.22E-01	2.87E+01	2.84E+01	NA	NA	NA	NA
Lindane	Mule Deer	0.022	1	0	0	0.017	4.26E-01	2.97E+01	2.84E+01	5.00E-02	NA	5.13E+00	NA
Methoxychlor	Mule Deer	0.022	1	0	0	0.017	3.00E-01	3.13E+01	2.85E+01	2.50E+00	NA	3.59E+02	NA
Methyl Ethyl Ketone	Mule Deer	0.022	1	0	0	0.017	1.16E+00	2.54E+01	2.86E+01	1.77E+03	NA	6.84E+04	NA
Methyl Methacrylate	Mule Deer	0.022	1	0	0	0.017	8.99E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Methylene Chloride	Mule Deer	0.022	1	0	0	0.017	8.86E-01	2.65E+01	2.85E+01	5.85E+00	1.71E+01	2.95E+02	8.61E+02
Methyl-tertbutyl ether	Mule Deer	0.022	1	0	0	0.017	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Napthalene	Mule Deer	0.022	1	0	0	0.017	4.19E+00	2.84E+01	3.19E+01	5.00E+01	8.66E+01	5.40E+02	9.36E+02
n-Nitrosodiphenylamine	Mule Deer	0.022	1	0	0	0.017	8.53E-01	2.66E+01	2.85E+01	5.80E+01	1.16E+02	3.03E+03	6.06E+03
n-Nitrosodipropylamine	Mule Deer	0.022	1	0	0	0.017	8.88E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	Mule Deer	0.022	1	0	0	0.017	1.01E+00	2.59E+01	2.85E+01	2.70E+01	NA	1.20E+03	NA
Pendimethalin	Mule Deer	0.022	1	0	0	0.017	3.71E-01	3.03E+01	2.84E+01	2.50E+00	NA	2.93E+02	NA
Pentachlorobenzene	Mule Deer	0.022	1	0	0	0.017	3.52E-01	3.06E+01	2.85E+01	8.50E-01	NA	1.05E+02	NA
Pentachloronitrobenzene	Mule Deer	0.022	1	0	0	0.017	3.52E-01	3.06E+01	2.85E+01	NA	NA	NA	NA
Pentachloronitrobenzene	Mule Deer	0.022	1	0	0	0.017	3.52E-01	3.06E+01	2.85E+01	2.00E+02	NA	2.47E+04	NA

306

Attachment Table 5
ESL Calculations for Organic ECOIs

			Dietary Proportion				Bioconcentration Factors			Toxicity Reference Values		Ecological Screening Level	
ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Vegetation	Invertebrate	Small Mammal	Soil in Diet	Soil to Plant	Soil to Invertebrate	Soil to Small Mammal	NOAEL (mg/kg day)	Threshold (mg/kg day)	NOAEL (mg/kg)	Threshold (mg/kg)
Pentachlorophenol	Mule Deer	0.022	1	0	0	0.017	3.73E-01	3.03E+01	2.84E+01	2.40E-01	7.60E-01	2.79E+01	8.85E+01
Phenol	Mule Deer	0.022	1	0	0	0.017	8.49E-01	2.66E+01	2.85E+01	4.00E+01	NA	2.10E+03	NA
p-Nitrotoluene	Mule Deer	0.022	1	0	0	0.017	6.86E-01	2.75E+01	2.84E+01	1.10E+02	1.17E+02	7.11E+03	7.58E+03
Pyrene	Mule Deer	0.022	1	0	0	0.017	3.70E+00	3.04E+01	3.15E+01	NA	NA	NA	NA
Styrene	Mule Deer	0.022	1	0	0	0.017	6.01E-01	2.81E+01	2.84E+01	3.00E+01	3.46E+01	2.21E+03	2.55E+03
Sulfotep	Mule Deer	0.022	1	0	0	0.017	4.57E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
Toluene	Mule Deer	0.022	1	0	0	0.017	6.56E-01	2.77E+01	2.84E+01	2.60E+01	NA	1.76E+03	NA
Toxaphene	Mule Deer	0.022	1	0	0	0.017	2.26E-01	3.27E+01	2.86E+01	8.00E+00	NA	1.49E+03	NA
trans-1,2-dichloroethene	Mule Deer	0.022	1	0	0	0.017	7.55E-01	2.71E+01	2.84E+01	4.52E+01	NA	2.66E+03	NA
Trichloroethene	Mule Deer	0.022	1	0	0	0.017	6.67E-01	2.77E+01	2.84E+01	7.00E-01	NA	4.65E+01	NA
Trichlorofluoromethane	Mule Deer	0.022	1	0	0	0.017	7.19E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
Trifluralin	Mule Deer	0.022	1	0	0	0.017	3.28E-01	3.09E+01	2.85E+01	3.25E+00	NA	4.28E+02	NA
Vinyl acetate	Mule Deer	0.022	1	0	0	0.017	1.03E+00	2.58E+01	2.85E+01	2.35E+01	NA	1.02E+03	NA
Vinyl Chloride	Mule Deer	0.022	1	0	0	0.017	8.26E-01	2.67E+01	2.84E+01	1.70E-01	NA	9.17E+00	NA
Xylene (Mixed)	Mule Deer	0.022	1	0	0	0.017	5.72E-01	2.83E+01	2.84E+01	2.10E+00	2.34E+00	1.62E+02	1.80E+02
1,1,1-Trichloroethane	PMJM	0.17	0.7	0.3	0	0.024	6.33E-01	2.79E+01	2.84E+01	1.00E+03	NA	6.66E+02	NA
1,1,2,2-Tetrachloroethane	PMJM	0.17	0.7	0.3	0	0.024	7.15E-01	2.74E+01	2.84E+01	1.08E+02	NA	7.28E+01	NA
1,1,2-Trichloroethane	PMJM	0.17	0.7	0.3	0	0.024	7.49E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
1,1-Dichloroethane	PMJM	0.17	0.7	0.3	0	0.024	7.97E-01	2.69E+01	2.84E+01	5.46E+00	NA	3.71E+00	NA
1,1-Dichloroethene	PMJM	0.17	0.7	0.3	0	0.024	7.29E-01	2.73E+01	2.84E+01	3.00E+01	NA	2.02E+01	NA
1,2,3-Trichloropropane	PMJM	0.17	0.7	0.3	0	0.024	6.62E-01	2.77E+01	2.84E+01	2.50E+01	NA	1.67E+01	NA
1,2,4,5-Tetrachlorobenzene	PMJM	0.17	0.7	0.3	0	0.024	3.95E-01	3.00E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trichlorobenzene	PMJM	0.17	0.7	0.3	0	0.024	4.63E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trimethylbenzene	PMJM	0.17	0.7	0.3	0	0.024	4.99E-01	2.89E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	PMJM	0.17	0.7	0.3	0	0.024	5.45E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichloroethane	PMJM	0.17	0.7	0.3	0	0.024	7.83E-01	2.70E+01	2.84E+01	5.00E+01	NA	3.40E+01	NA
1,2-Dichloroethene	PMJM	0.17	0.7	0.3	0	0.024	7.55E-01	2.71E+01	2.84E+01	4.52E+01	NA	3.06E+01	NA
1,2-Dichloropropane	PMJM	0.17	0.7	0.3	0	0.024	7.05E-01	2.74E+01	2.84E+01	8.90E+01	1.26E+02	5.99E+01	8.49E+01
1,3,5-Trimethylbenzene	PMJM	0.17	0.7	0.3	0	0.024	4.99E-01	2.89E+01	2.84E+01	1.43E+01	NA	9.29E+00	NA
1,3-Dichloropropene	PMJM	0.17	0.7	0.3	0	0.024	6.98E-01	2.75E+01	2.84E+01	5.00E+00	8.66E+00	3.36E+00	5.82E+00
1,3-Isobenzofurnadione	PMJM	0.17	0.7	0.3	0	0.024	7.38E-01	2.72E+01	2.84E+01	7.57E+02	NA	5.12E+02	NA
1,4 Dioxane	PMJM	0.17	0.7	0.3	0	0.024	1.34E+00	2.48E+01	2.88E+01	2.96E+01	NA	2.07E+01	NA
1,4-Dichlorobenzene (-p)	PMJM	0.17	0.7	0.3	0	0.024	5.45E-01	2.85E+01	2.84E+01	1.07E+02	1.51E+02	7.02E+01	9.93E+01
1-Methyl napthalene	PMJM	0.17	0.7	0.3	0	0.024	4.88E-01	2.90E+01	2.84E+01	1.40E+01	NA	9.07E+00	NA
2,3,4,6 Tetrachlorophenol	PMJM	0.17	0.7	0.3	0	0.024	4.45E-01	2.95E+01	2.84E+01	1.00E+01	NA	6.41E+00	NA
2,4,5-Trichlorophenol	PMJM	0.17	0.7	0.3	0	0.024	5.22E-01	2.87E+01	2.84E+01	NA	NA	NA	NA
2,4,5-Trichlorophenoxy Acetic Acid	PMJM	0.17	0.7	0.3	0	0.024	5.48E-01	2.85E+01	2.84E+01	3.00E-01	5.50E-01	1.97E-01	3.61E-01
2,4,6-Trichlorophenol	PMJM	0.17	0.7	0.3	0	0.024	5.22E-01	2.87E+01	2.84E+01	3.00E-01	NA	1.96E-01	NA
2,4,6-Trinitrotoluene	PMJM	0.17	0.7	0.3	0	0.024	7.53E-01	2.71E+01	2.84E+01	5.00E-01	1.18E+00	3.38E-01	7.99E-01
2,4-Dichlorophenol	PMJM	0.17	0.7	0.3	0	0.024	6.15E-01	2.80E+01	2.84E+01	5.00E+00	NA	3.32E+00	NA
2,4-Dinitrophenol	PMJM	0.17	0.7	0.3	0	0.024	8.03E-01	2.69E+01	2.84E+01	1.25E+02	2.09E+02	8.51E+01	1.42E+02
2,4-Dinitrotoluene	PMJM	0.17	0.7	0.3	0	0.024	7.18E-01	2.73E+01	2.84E+01	5.70E-02	NA	3.84E-02	NA
2,6-Dinitrotoluene	PMJM	0.17	0.7	0.3	0	0.024	7.18E-01	2.73E+01	2.84E+01	1.10E+01	1.96E+01	7.41E+00	1.32E+01
2-Chloronaphthalene	PMJM	0.17	0.7	0.3	0	0.024	4.77E-01	2.91E+01	2.84E+01	NA	NA	NA	NA
2-Chlorophenol	PMJM	0.17	0.7	0.3	0	0.024	7.21E-01	2.73E+01	2.84E+01	5.00E-01	NA	3.37E-01	NA
2-Methylnaphthalene	PMJM	0.17	0.7	0.3	0	0.024	4.88E-01	2.90E+01	2.84E+01	5.23E+00	7.61E+00	3.39E+00	4.93E+00
2-Methylphenol	PMJM	0.17	0.7	0.3	0	0.024	7.40E-01	2.72E+01	2.84E+01	2.19E+02	NA	1.48E+02	NA
2-Nitroaniline	PMJM	0.17	0.7	0.3	0	0.024	7.47E-01	2.72E+01	2.84E+01	1.00E+01	NA	6.76E+00	NA
3,3-Dichlorobenzidine	PMJM	0.17	0.7	0.3	0	0.024	5.55E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
4-(2,4-Dichlorophenoxy) Butyric Acid	PMJM	0.17	0.7	0.3	0	0.024	5.03E-01	2.89E+01	2.84E+01	8.00E-01	NA	5.20E-01	NA
4,6-Dinitro-2-methylphenol	PMJM	0.17	0.7	0.3	0	0.024	7.02E-01	2.74E+01	2.84E+01	1.00E+00	NA	6.73E-01	NA
4-Chloroaniline	PMJM	0.17	0.7	0.3	0	0.024	8.05E-01	2.69E+01	2.84E+01	1.25E+00	NA	8.51E-01	NA
4-Methyl-2-Pentanone	PMJM	0.17	0.7	0.3	0	0.024	9.26E-01	2.63E+01	2.85E+01	2.50E+01	NA	1.72E+01	NA
4-Nitroanoline	PMJM	0.17	0.7	0.3	0	0.024	8.57E-01	2.66E+01	2.85E+01	7.10E+01	NA	4.86E+01	NA
4-Nitrophenol	PMJM	0.17	0.7	0.3	0	0.024	7.68E-01	2.71E+01	2.84E+01	2.50E+01	NA	1.69E+01	NA
Acenaphthene	PMJM	0.17	0.7	0.3	0	0.024	4.38E-01	2.95E+01	2.84E+01	NA	NA	NA	NA
Acetone	PMJM	0.17	0.7	0.3	0	0.024	1.32E+00	2.49E+01	2.87E+01	1.00E+01	2.24E+01	7.00E+00	1.56E+01
Aldrin	PMJM	0.17	0.7	0.3	0	0.024	2.29E-01	3.27E+01	2.86E+01	1.00E-01	NA	5.89E-02	NA
alpha-BHC	PMJM.	0.17	0.7	0.3	0	0.024	4.26E-01	2.97E+01	2.84E+01	3.60E+01	NA	2.30E+01	NA
Ammonium (as Ammonia)	PMJM	0.17	0.7	0.3	0	0.024	1.17E+00	2.53E+01	2.86E+01	9.66E+02	NA	6.73E+02	NA
Anthracene	PMJM	0.17	0.7	0.3	0	0.024	3.10E+00	2.98E+01	3.09E+01	NA	NA	NA	NA

Attachment Table 5
ESL Calculations for Organic ECOIs

ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Dietary Proportion: Vegetation	Dietary Proportion: Invertebrate	Dietary Proportion: Small Mammal	Dietary Proportion: Soil in Diet	Bioconcentration Factors: Soil to Plant	Bioconcentration Factors: Soil to Invertebrate	Bioconcentration Factors: Soil to Small Mammal	Toxicity Reference Values: NOAEL (mg/kg day)	Toxicity Reference Values: Threshold (mg/kg day)	Ecological Screening Level: NOAEL (mg/kg)	Ecological Screening Level: Threshold (mg/kg)
Benzene	PMJM	0.17	0.7	0.3	0	0.024	7.53E-01	2.71E+01	2.84E+01	2.64E+01	NA	1.78E+01	NA
Benzo(a)pyrene	PMJM	0.17	0.7	0.3	0	0.024	2.00E-01	3.19E+01	2.85E+01	1.31E+00	6.55E+00	7.92E-01	3.96E+00
Benzyl alcohol	PMJM	0.17	0.7	0.3	0	0.024	9.45E-01	2.62E+01	2.85E+01	7.50E+00	NA	5.17E+00	NA
Beta-BHC	PMJM	0.17	0.7	0.3	0	0.024	4.26E-01	2.97E+01	2.84E+01	4.00E-01	8.94E-01	2.55E-01	5.71E-01
BHC (Mixed)	PMJM	0.17	0.7	0.3	0	0.024	4.26E-01	2.97E+01	2.84E+01	1.60E+00	2.26E+00	1.02E+00	1.44E+00
bis(2-chloroethyl)ether	PMJM	0.17	0.7	0.3	0	0.024	8.38E-01	2.67E+01	2.84E+01	NA	NA	NA	NA
bis(2-chloroisopropyl)ether	PMJM	0.17	0.7	0.3	0	0.024	6.81E-01	2.76E+01	2.84E+01	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	PMJM	0.17	0.7	0.3	0	0.024	1.52E-01	3.49E+01	2.88E+01	1.83E+01	NA	1.02E+01	NA
Bromodichloromethane	PMJM	0.17	0.7	0.3	0	0.024	8.28E-01	2.67E+01	2.84E+01	1.00E+01	1.41E+01	6.82E+00	9.62E+00
Bromoform	PMJM	0.17	0.7	0.3	0	0.024	7.91E-01	2.69E+01	2.84E+01	5.00E+00	NA	3.40E+00	NA
Bromomethane (methyl bromide)	PMJM	0.17	0.7	0.3	0	0.024	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Butylbenzylphthalate	PMJM	0.17	0.7	0.3	0	0.024	4.04E-01	2.99E+01	2.84E+01	4.70E+01	8.16E+01	2.98E+01	5.17E+01
Carbazole	PMJM	0.17	0.7	0.3	0	0.024	5.52E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
Carbon disulfide	PMJM	0.17	0.7	0.3	0	0.024	7.62E-01	2.71E+01	2.84E+01	1.00E+01	NA	6.77E+00	NA
Carbon Tetrachloride	PMJM	0.17	0.7	0.3	0	0.024	6.72E-01	2.76E+01	2.84E+01	1.60E+01	NA	1.07E+01	NA
Chlordane	PMJM	0.17	0.7	0.3	0	0.024	2.58E-01	3.21E+01	2.86E+01	4.60E+00	NA	2.75E+00	NA
Chlorobenzene	PMJM	0.17	0.7	0.3	0	0.024	6.40E-01	2.78E+01	2.84E+01	8.60E+00	1.22E+01	5.73E+00	8.13E+00
Chloroform	PMJM	0.17	0.7	0.3	0	0.024	8.47E-01	2.66E+01	2.84E+01	1.50E+01	2.48E+01	1.02E+01	1.69E+01
cis-1,2-dichloroethene	PMJM	0.17	0.7	0.3	0	0.024	7.55E-01	2.71E+01	2.84E+01	3.20E+00	NA	2.17E+00	NA
DDD	PMJM	0.17	0.7	0.3	0	0.024	8.00E-02	3.16E+01	2.83E+01	2.82E+01	NA	1.74E+01	NA
DDE	PMJM	0.17	0.7	0.3	0	0.024	6.20E-01	3.27E+01	2.90E+01	1.10E+00	NA	6.30E-01	NA
DDT	PMJM	0.17	0.7	0.3	0	0.024	8.00E-02	3.24E+01	2.85E+01	8.00E-01	3.58E+00	4.80E-01	2.15E+00
Dibenzofuran	PMJM	0.17	0.7	0.3	0	0.024	4.89E-01	2.90E+01	2.84E+01	4.00E+01	NA	NA	2.59E+01
Dibromochloromethane	PMJM	0.17	0.7	0.3	0	0.024	8.09E-01	2.68E+01	2.84E+01	1.00E+01	NA	6.81E+00	NA
Dicamba	PMJM	0.17	0.7	0.3	0	0.024	7.25E-01	2.73E+01	2.84E+01	3.00E+00	NA	2.02E+00	NA
Dichlorodifluoromethane	PMJM	0.17	0.7	0.3	0	0.024	7.85E-01	2.70E+01	2.84E+01	1.50E+00	NA	1.02E+00	NA
Dieldrin	PMJM	0.17	0.7	0.3	0	0.024	1.64E+00	3.12E+01	2.97E+01	1.50E-02	2.12E-02	8.38E-03	1.19E-02
Diethyl Ether	PMJM	0.17	0.7	0.3	0	0.024	9.52E-01	2.62E+01	2.85E+01	5.00E+01	NA	3.45E+01	NA
Diethylphthalate	PMJM	0.17	0.7	0.3	0	0.024	6.38E-01	2.78E+01	2.84E+01	4.58E+03	NA	3.05E+03	NA
Dimethoate	PMJM	0.17	0.7	0.3	0	0.024	1.15E+00	2.54E+01	2.86E+01	NA	NA	NA	NA
Dimethylphthalate	PMJM	0.17	0.7	0.3	0	0.024	8.17E-01	2.68E+01	2.84E+01	3.50E+02	NA	2.38E+02	NA
Di-n-butyl phthalate	PMJM	0.17	0.7	0.3	0	0.024	3.91E-01	3.01E+01	2.84E+01	5.50E+02	NA	3.47E+02	NA
Di-n-octylphthalate	PMJM	0.17	0.7	0.3	0	0.024	1.46E-01	3.51E+01	2.88E+01	1.67E+03	3.54E+03	9.22E+02	1.95E+03
Endosulfan	PMJM	0.17	0.7	0.3	0	0.024	5.16E-01	2.88E+01	2.84E+01	1.50E-01	NA	9.78E-02	NA
Endrin	PMJM	0.17	0.7	0.3	0	0.024	3.17E-01	3.11E+01	2.85E+01	9.20E-02	NA	5.66E-02	NA
Ethyl acetate	PMJM	0.17	0.7	0.3	0	0.024	9.13E-01	2.63E+01	2.85E+01	9.00E+01	NA	6.18E+01	NA
Ethylbenzene	PMJM	0.17	0.7	0.3	0	0.024	5.80E-01	2.83E+01	2.84E+01	NA	NA	NA	NA
Fluoranthene	PMJM	0.17	0.7	0.3	0	0.024	6.03E+00	3.04E+01	3.37E+01	NA	NA	NA	NA
Fluorene	PMJM	0.17	0.7	0.3	0	0.024	6.00E-02	2.94E+01	2.80E+01	NA	NA	NA	NA
Fluoride	PMJM	0.17	0.7	0.3	0	0.024	1.17E+00	2.53E+01	2.86E+01	3.14E+01	NA	2.19E+01	NA
Heptachlor	PMJM	0.17	0.7	0.3	0	0.024	2.86E-01	3.16E+01	2.85E+01	1.30E-01	9.40E-01	7.89E-02	5.70E-01
Heptachlor epoxide	PMJM	0.17	0.7	0.3	0	0.024	3.96E-01	3.00E+01	2.84E+01	1.25E-01	NA	7.90E-02	NA
Hexachlorobenzene	PMJM	0.17	0.7	0.3	0	0.024	2.86E-01	3.16E+01	2.85E+01	2.00E+00	NA	1.21E+00	NA
Hexachlorobutadiene	PMJM	0.17	0.7	0.3	0	0.024	3.80E-01	3.02E+01	2.84E+01	2.00E+00	NA	1.26E+00	NA
Hexachlorocyclopentadiene	PMJM	0.17	0.7	0.3	0	0.024	3.89E-01	3.01E+01	2.84E+01	1.08E+01	NA	6.81E+00	NA
Hexachloroethane	PMJM	0.17	0.7	0.3	0	0.024	4.52E-01	2.94E+01	2.84E+01	7.00E-01	9.90E-01	4.50E-01	6.36E-01
Isophorone	PMJM	0.17	0.7	0.3	0	0.024	6.43E-01	2.78E+01	2.84E+01	NA	NA	NA	NA
Isopropylbenzene	PMJM	0.17	0.7	0.3	0	0.024	5.22E-01	2.87E+01	2.84E+01	NA	NA	NA	NA
Lindane	PMJM	0.17	0.7	0.3	0	0.024	4.26E-01	2.97E+01	2.84E+01	5.00E-02	NA	3.19E-02	NA
Methoxychlor	PMJM	0.17	0.7	0.3	0	0.024	3.00E-01	3.13E+01	2.85E+01	2.50E+00	NA	1.53E+00	NA
Methyl Ethyl Ketone	PMJM	0.17	0.7	0.3	0	0.024	1.16E+00	2.54E+01	2.86E+01	1.77E+03	NA	1.23E+03	NA
Methyl Methacrylate	PMJM	0.17	0.7	0.3	0	0.024	8.99E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Methylene Chloride	PMJM	0.17	0.7	0.3	0	0.024	8.86E-01	2.65E+01	2.85E+01	5.85E+00	1.71E+01	4.01E+00	1.17E+01
Methyl-tertbutyl ether	PMJM	0.17	0.7	0.3	0	0.024	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Napthalene	PMJM	0.17	0.7	0.3	0	0.024	4.19E+00	2.84E+01	3.19E+01	5.00E+01	8.66E+01	2.56E+01	4.44E+01
n-Nitrosodiphenylamine	PMJM	0.17	0.7	0.3	0	0.024	8.53E-01	2.66E+01	2.85E+01	5.80E+01	1.16E+02	3.97E+01	7.93E+01
n-Nitrosodipropylamine	PMJM	0.17	0.7	0.3	0	0.024	8.88E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	PMJM	0.17	0.7	0.3	0	0.024	1.01E+00	2.59E+01	2.85E+01	2.70E+01	NA	1.87E+01	NA
Pendimethalin	PMJM	0.17	0.7	0.3	0	0.024	3.71E-01	3.03E+01	2.84E+01	2.50E+00	NA	1.57E+00	NA
Pentachlorobenzene	PMJM	0.17	0.7	0.3	0	0.024	3.52E-01	3.06E+01	2.85E+01	8.50E-01	NA	5.30E-01	NA
Pentachloronitrobenzene	PMJM	0.17	0.7	0.3	0	0.024	3.52E-01	3.06E+01	2.85E+01	NA	NA	NA	NA

308

Attachment Table 5
ESL Calculations for Organic ECOIs

ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Dietary Proportion: Vegetation	Dietary Proportion: Invertebrate	Dietary Proportion: Small Mammal	Dietary Proportion: Soil in Diet	Bioconcentration Factors: Soil to Plant	Bioconcentration Factors: Soil to Invertebrate	Bioconcentration Factors: Soil to Small Mammal	Toxicity Reference Values: NOAEL (mg/kg day)	Toxicity Reference Values: Threshold (mg/kg day)	Ecological Screening Level: NOAEL (mg/kg)	Ecological Screening Level: Threshold (mg/kg)
Pentachloronitrobenzene	PMJM	0.17	0.7	0.3	0	0.024	3.52E-01	3.06E+01	2.85E+01	2.00E+02	NA	1.25E+02	NA
Pentachlorophenol	PMJM	0.17	0.7	0.3	0	0.024	3.73E-01	3.03E+01	2.84E+01	2.40E-01	7.60E-01	1.51E-01	4.77E-01
Phenol	PMJM	0.17	0.7	0.3	0	0.024	8.49E-01	2.66E+01	2.85E+01	4.00E+01	NA	2.73E+01	NA
p-Nitrotoluene	PMJM	0.17	0.7	0.3	0	0.024	6.86E-01	2.75E+01	2.84E+01	1.10E+02	1.17E+02	7.38E+01	7.87E+01
Pyrene	PMJM	0.17	0.7	0.3	0	0.024	3.70E+00	3.04E+01	3.15E+01	NA	NA	NA	NA
Styrene	PMJM	0.17	0.7	0.3	0	0.024	6.01E-01	2.81E+01	2.84E+01	3.00E+01	3.46E+01	1.99E+01	2.29E+01
Sulfotep	*PMJM	0.17	0.7	0.3	0	0.024	4.57E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
Toluene	PMJM	0.17	0.7	0.3	0	0.024	6.56E-01	2.77E+01	2.84E+01	2.60E+01	NA	1.74E+01	NA
Toxaphene	PMJM	0.17	0.7	0.3	0	0.024	2.26E-01	3.27E+01	2.86E+01	8.00E+00	NA	4.70E+00	NA
trans-1,2-dichloroethene	PMJM	0.17	0.7	0.3	0	0.024	7.55E-01	2.71E+01	2.84E+01	4.52E+01	NA	3.06E+01	NA
Trichloroethene	PMJM	0.17	0.7	0.3	0	0.024	6.67E-01	2.77E+01	2.84E+01	7.00E-01	NA	4.69E-01	NA
Trichlorofluoromethane	PMJM	0.17	0.7	0.3	0	0.024	7.19E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
Trifluralin	PMJM	0.17	0.7	0.3	0	0.024	3.28E-01	3.09E+01	2.85E+01	3.25E+00	NA	2.01E+00	NA
Vinyl acetate	PMJM	0.17	0.7	0.3	0	0.024	1.03E+00	2.58E+01	2.85E+01	2.35E+01	NA	1.63E+01	NA
Vinyl Chloride	PMJM	0.17	0.7	0.3	0	0.024	8.26E-01	2.67E+01	2.84E+01	1.70E-01	NA	1.16E-01	NA
Xylene (Mixed)	PMJM	0.17	0.7	0.3	0	0.024	5.72E-01	2.83E+01	2.84E+01	2.10E+00	2.34E+00	1.38E+00	1.54E+00
1,1,1-Trichloroethane	Prairie Dog	0.029	1	0	0	0.077	6.33E-01	2.79E+01	2.84E+01	1.00E+03	NA	4.85E+04	NA
1,1,2,2-Tetrachloroethane	Prairie Dog	0.029	1	0	0	0.077	7.15E-01	2.74E+01	2.84E+01	1.08E+02	NA	4.70E+03	NA
1,1,2-Trichloroethane	Prairie Dog	0.029	1	0	0	0.077	7.49E-01	2.72E+01	2.84E+01	NA	NA	NA	NA
1,1-Dichloroethane	Prairie Dog	0.029	1	0	0	0.077	7.97E-01	2.69E+01	2.84E+01	5.46E+00	NA	2.15E+02	NA
1,1-Dichloroethene	Prairie Dog	0.029	1	0	0	0.077	7.29E-01	2.73E+01	2.84E+01	3.00E+01	NA	1.28E+03	NA
1,2,3-Trichloropropane	Prairie Dog	0.029	1	0	0	0.077	6.62E-01	2.77E+01	2.84E+01	2.50E+01	NA	1.17E+03	NA
1,2,4,5-Tetrachlorobenzene	Prairie Dog	0.029	1	0	0	0.077	3.95E-01	3.00E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trichlorobenzene	Prairie Dog	0.029	1	0	0	0.077	4.63E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
1,2,4-Trimethylbenzene	Prairie Dog	0.029	1	0	0	0.077	4.99E-01	2.89E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	Prairie Dog	0.029	1	0	0	0.077	5.45E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
1,2-Dichloroethane	Prairie Dog	0.029	1	0	0	0.077	7.83E-01	2.70E+01	2.84E+01	5.00E+01	NA	2.00E+03	NA
1,2-Dichloroethene	Prairie Dog	0.029	1	0	0	0.077	7.55E-01	2.71E+01	2.84E+01	4.52E+01	NA	1.87E+03	NA
1,2-Dichloropropane	Prairie Dog	0.029	1	0	0	0.077	7.05E-01	2.74E+01	2.84E+01	8.90E+01	1.26E+02	3.92E+03	5.56E+03
1,3,5-Trimethylbenzene	Prairie Dog	0.029	1	0	0	0.077	4.99E-01	2.89E+01	2.84E+01	1.43E+01	NA	8.56E+02	NA
1,3-Dichloropropene	Prairie Dog	0.029	1	0	0	0.077	6.98E-01	2.75E+01	2.84E+01	5.00E+00	8.66E+00	2.22E+02	3.85E+02
1,3-Isobenzofurnadione	Prairie Dog	0.029	1	0	0	0.077	7.38E-01	2.72E+01	2.84E+01	7.57E+02	NA	3.20E+04	NA
1,4 Dioxane	Prairie Dog	0.029	1	0	0	0.077	1.34E+00	2.48E+01	2.88E+01	2.96E+01	NA	7.19E+02	NA
1,4-Dichlorobenzene (-p)	Prairie Dog	0.029	1	0	0	0.077	5.45E-01	2.85E+01	2.84E+01	1.07E+02	1.51E+02	5.93E+03	8.39E+03
1-Methyl napthalene	Prairie Dog	0.029	1	0	0	0.077	4.88E-01	2.90E+01	2.84E+01	1.40E+01	NA	8.54E+02	NA
2,3,4,6 Tetrachlorophenol	Prairie Dog	0.029	1	0	0	0.077	4.45E-01	2.95E+01	2.84E+01	1.00E+01	NA	6.61E+02	NA
2,4,5-Trichlorophenol	Prairie Dog	0.029	1	0	0	0.077	5.22E-01	2.87E+01	2.84E+01	1.00E+01	1.73E+01	5.75E+02	9.95E+02
2,4,5-Trichlorophenoxy Acetic Acid	Prairie Dog	0.029	1	0	0	0.077	5.48E-01	2.85E+01	2.84E+01	3.00E-01	5.50E-01	1.66E+01	3.04E+01
2,4,6-Trichlorophenol	Prairie Dog	0.029	1	0	0	0.077	5.22E-01	2.87E+01	2.84E+01	3.00E-01	NA	1.73E+01	NA
2,4,6-Trinitrotoluene	Prairie Dog	0.029	1	0	0	0.077	7.53E-01	2.71E+01	2.84E+01	5.00E-01	1.18E+00	2.08E+01	4.90E+01
2,4-Dichlorophenol	Prairie Dog	0.029	1	0	0	0.077	6.15E-01	2.80E+01	2.84E+01	5.00E+00	NA	2.49E+02	NA
2,4-Dinitrophenol	Prairie Dog	0.029	1	0	0	0.077	8.03E-01	2.69E+01	2.84E+01	1.25E+02	2.09E+02	4.90E+03	8.19E+03
2,4-Dinitrotoluene	Prairie Dog	0.029	1	0	0	0.077	7.18E-01	2.73E+01	2.84E+01	5.70E-02	NA	2.47E+00	NA
2,6-Dinitrotoluene	Prairie Dog	0.029	1	0	0	0.077	7.18E-01	2.73E+01	2.84E+01	1.10E+01	1.96E+01	4.77E+02	8.51E+02
2-Chloronaphthalene	Prairie Dog	0.029	1	0	0	0.077	4.77E-01	2.91E+01	2.84E+01	NA	NA	NA	NA
2-Chlorophenol	Prairie Dog	0.029	1	0	0	0.077	7.21E-01	2.73E+01	2.84E+01	5.00E-01	NA	2.16E+01	NA
2-Methylnaphthalene	Prairie Dog	0.029	1	0	0	0.077	4.88E-01	2.90E+01	2.84E+01	5.23E+00	7.61E+00	3.19E+02	4.64E+02
2-Methylphenol	Prairie Dog	0.029	1	0	0	0.077	7.40E-01	2.72E+01	2.84E+01	2.19E+02	NA	9.26E+03	NA
2-Nitroaniline	Prairie Dog	0.029	1	0	0	0.077	7.47E-01	2.72E+01	2.84E+01	1.00E+01	NA	4.18E+02	NA
3,3-Dichlorobenzidine	Prairie Dog	0.029	1	0	0	0.077	5.55E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
4-(2,4-Dichlorophenoxy) Butyric Acid	Prairie Dog	0.029	1	0	0	0.077	5.03E-01	2.89E+01	2.84E+01	8.00E-01	NA	4.76E+01	NA
4,6-Dinitro-2-methylphenol	Prairie Dog	0.029	1	0	0	0.077	7.02E-01	2.74E+01	2.84E+01	1.00E+00	NA	4.43E+01	NA
4-Chloroaniline	Prairie Dog	0.029	1	0	0	0.077	8.05E-01	2.69E+01	2.84E+01	1.25E+00	NA	4.89E+01	NA
4-Methyl-2-Pentanone	Prairie Dog	0.029	1	0	0	0.077	9.26E-01	2.63E+01	2.85E+01	2.50E+01	NA	8.59E+02	NA
4-Nitroanoline	Prairie Dog	0.029	1	0	0	0.077	8.57E-01	2.66E+01	2.85E+01	7.10E+01	NA	2.62E+03	NA
4-Nitrophenol	Prairie Dog	0.029	1	0	0	0.077	7.68E-01	2.71E+01	2.84E+01	2.50E+01	NA	1.02E+03	NA
Acenaphthene	Prairie Dog	0.029	1	0	0	0.077	4.38E-01	2.95E+01	2.84E+01	NA	NA	NA	NA
Acetone	Prairie Dog	0.029	1	0	0	0.077	1.32E+00	2.49E+01	2.87E+01	1.00E+01	2.24E+01	2.48E+02	5.54E+02
Aldrin	Prairie Dog	0.029	1	0	0	0.077	2.29E-01	3.27E+01	2.86E+01	1.00E-01	NA	1.13E+01	NA
alpha-BHC	Prairie Dog	0.029	1	0	0	0.077	4.26E-01	2.97E+01	2.84E+01	3.60E+01	NA	2.47E+03	NA
Ammonium (as Ammonia)	Prairie Dog	0.029	1	0	0	0.077	1.17E+00	2.53E+01	2.86E+01	9.66E+02	NA	2.67E+04	NA

309

Attachment Table 5
ESL Calculations for Organic ECOIs

ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Dietary Proportion: Vegetation	Dietary Proportion: Invertebrate	Dietary Proportion: Small Mammal	Dietary Proportion: Soil in Diet	Bioconcentration Factors: Soil to Plant	Bioconcentration Factors: Soil to Invertebrate	Bioconcentration Factors: Soil to Small Mammal	Toxicity Reference Values: NOAEL (mg/kg day)	Toxicity Reference Values: Threshold (mg/kg day)	Ecological Screening Level: NOAEL (mg/kg)	Ecological Screening Level: Threshold (mg/kg)
Anthracene	Prairie Dog	0.029	1	0	0	0.077	3.10E+00	2.98E+01	3.09E+01	NA	NA	NA	NA
Benzene	Prairie Dog	0.029	1	0	0	0.077	7.53E-01	2.71E+01	2.84E+01	2.64E+01	NA	1.10E+03	NA
Benzo(a)pyrene	Prairie Dog	0.029	1	0	0	0.077	2.00E-01	3.19E+01	2.85E+01	1.31E+00	6.55E+00	1.63E+02	8.16E+02
Benzyl alcohol	Prairie Dog	0.029	1	0	0	0.077	9.45E-01	2.62E+01	2.85E+01	7.50E+00	NA	2.53E+02	NA
Beta-BHC	Prairie Dog	0.029	1	0	0	0.077	4.26E-01	2.97E+01	2.84E+01	4.00E-01	8.94E-01	2.74E+01	6.13E+01
BHC (Mixed)	Prairie Dog	0.029	1	0	0	0.077	4.26E-01	2.97E+01	2.84E+01	1.60E+00	2.26E+00	1.10E+02	1.55E+02
bis(2-chloroethyl)ether	Prairie Dog	0.029	1	0	0	0.077	8.38E-01	2.67E+01	2.84E+01	NA	NA	NA	NA
bis(2-chloroisopropyl)ether	Prairie Dog	0.029	1	0	0	0.077	6.81E-01	2.76E+01	2.84E+01	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	Prairie Dog	0.029	1	0	0	0.077	1.52E-01	3.49E+01	2.88E+01	1.83E+01	NA	2.76E+03	NA
Bromodichloromethane	Prairie Dog	0.029	1	0	0	0.077	8.28E-01	2.67E+01	2.84E+01	1.00E+01	1.41E+01	3.81E+02	5.37E+02
Bromoform	Prairie Dog	0.029	1	0	0	0.077	7.91E-01	2.69E+01	2.84E+01	5.00E+00	NA	1.99E+02	NA
Bromomethane (methyl bromide)	Prairie Dog	0.029	1	0	0	0.077	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Butylbenzylphthalate	Prairie Dog	0.029	1	0	0	0.077	4.04E-01	2.99E+01	2.84E+01	4.70E+01	8.16E+01	3.37E+03	5.86E+03
Carbazole	Prairie Dog	0.029	1	0	0	0.077	5.52E-01	2.85E+01	2.84E+01	NA	NA	NA	NA
Carbon disulfide	Prairie Dog	0.029	1	0	0	0.077	7.62E-01	2.71E+01	2.84E+01	1.00E+01	NA	4.11E+02	NA
Carbon Tetrachloride	Prairie Dog	0.029	1	0	0	0.077	6.72E-01	2.76E+01	2.84E+01	1.60E+01	NA	7.36E+02	NA
Chlordane	Prairie Dog	0.029	1	0	0	0.077	2.58E-01	3.21E+01	2.86E+01	4.60E+00	NA	4.73E+02	NA
Chlorobenzene	Prairie Dog	0.029	1	0	0	0.077	6.40E-01	2.78E+01	2.84E+01	8.60E+00	1.22E+01	4.14E+02	5.87E+02
Chloroform	Prairie Dog	0.029	1	0	0	0.077	8.47E-01	2.66E+01	2.84E+01	1.50E+01	2.48E+01	5.60E+02	9.26E+02
cis-1,2-dichloroethene	Prairie Dog	0.029	1	0	0	0.077	7.55E-01	2.71E+01	2.84E+01	3.20E+00	NA	1.33E+02	NA
DDD	Prairie Dog	0.029	1	0	0	0.077	8.00E-02	3.16E+01	2.83E+01	2.82E+01	NA	6.19E+03	NA
DDE	Prairie Dog	0.029	1	0	0	0.077	6.20E-01	3.27E+01	2.90E+01	1.10E+00	NA	5.44E+01	NA
DDT	Prairie Dog	0.029	1	0	0	0.077	8.00E-02	3.24E+01	2.85E+01	8.00E-01	3.58E+00	1.76E+02	7.86E+02
Dibenzofuran	Prairie Dog	0.029	1	0	0	0.077	4.89E-01	2.90E+01	2.84E+01	4.00E+01	NA	NA	2.44E+03
Dibromochloromethane	Prairie Dog	0.029	1	0	0	0.077	8.09E-01	2.68E+01	2.84E+01	1.00E+01	NA	3.89E+02	NA
Dicamba	Prairie Dog	0.029	1	0	0	0.077	7.25E-01	2.73E+01	2.84E+01	3.00E+00	NA	1.29E+02	NA
Dichlorodifluoromethane	Prairie Dog	0.029	1	0	0	0.077	7.85E-01	2.70E+01	2.84E+01	1.50E+00	NA	6.00E+01	NA
Dieldrin	Prairie Dog	0.029	1	0	0	0.077	1.64E+00	3.12E+01	2.97E+01	1.50E-02	2.12E-02	3.01E-01	4.26E-01
Diethyl Ether	Prairie Dog	0.029	1	0	0	0.077	9.52E-01	2.62E+01	2.85E+01	5.00E+01	NA	1.68E+03	NA
Diethylphthalate	Prairie Dog	0.029	1	0	0	0.077	6.38E-01	2.78E+01	2.84E+01	4.58E+03	NA	2.21E+05	NA
Dimethoate	Prairie Dog	0.029	1	0	0	0.077	1.15E+00	2.54E+01	2.86E+01	NA	NA	NA	NA
Dimethylphthalate	Prairie Dog	0.029	1	0	0	0.077	8.17E-01	2.68E+01	2.84E+01	3.50E+02	NA	1.35E+04	NA
Di-n-butyl phthalate	Prairie Dog	0.029	1	0	0	0.077	3.91E-01	3.01E+01	2.84E+01	5.50E+02	NA	4.06E+04	NA
Di-n-octylphthalate	Prairie Dog	0.029	1	0	0	0.077	1.46E-01	3.51E+01	2.88E+01	1.67E+03	3.54E+03	2.58E+05	5.47E+05
Endosulfan	Prairie Dog	0.029	1	0	0	0.077	5.16E-01	2.88E+01	2.84E+01	1.50E-01	NA	8.73E+00	NA
Endrin	Prairie Dog	0.029	1	0	0	0.077	3.17E-01	3.11E+01	2.85E+01	9.20E-02	NA	8.06E+00	NA
Ethyl acetate	Prairie Dog	0.029	1	0	0	0.077	9.13E-01	2.63E+01	2.85E+01	9.00E+01	NA	3.14E+03	NA
Ethylbenzene	Prairie Dog	0.029	1	0	0	0.077	5.80E-01	2.83E+01	2.84E+01	9.70E+00	NA	5.09E+02	NA
Fluoranthene	Prairie Dog	0.029	1	0	0	0.077	6.03E+00	3.04E+01	3.37E+01	NA	NA	NA	NA
Fluorene	Prairie Dog	0.029	1	0	0	0.077	6.00E-02	2.94E+01	2.80E+01	2.50E+01	NA	6.29E+03	NA
Fluoride	Prairie Dog	0.029	1	0	0	0.077	1.17E+00	2.53E+01	2.86E+01	3.14E+01	NA	8.67E+02	NA
Heptachlor	Prairie Dog	0.029	1	0	0	0.077	2.86E-01	3.16E+01	2.85E+01	1.30E-01	9.40E-01	1.24E+01	8.94E+01
Heptachlor epoxide	Prairie Dog	0.029	1	0	0	0.077	3.96E-01	3.00E+01	2.84E+01	1.25E-01	NA	9.12E+00	NA
Hexachlorobenzene	Prairie Dog	0.029	1	0	0	0.077	2.86E-01	3.16E+01	2.85E+01	2.00E+00	NA	1.90E+02	NA
Hexachlorobutadiene	Prairie Dog	0.029	1	0	0	0.077	3.80E-01	3.02E+01	2.84E+01	2.00E+00	NA	1.51E+02	NA
Hexachlorocyclopentadiene	Prairie Dog	0.029	1	0	0	0.077	3.89E-01	3.01E+01	2.84E+01	1.08E+01	NA	8.00E+02	NA
Hexachloroethane	Prairie Dog	0.029	1	0	0	0.077	4.52E-01	2.94E+01	2.84E+01	7.00E-01	9.90E-01	4.57E+01	6.46E+01
Isophorone	Prairie Dog	0.029	1	0	0	0.077	6.43E-01	2.78E+01	2.84E+01	NA	NA	NA	NA
Isopropylbenzene	Prairie Dog	0.029	1	0	0	0.077	5.22E-01	2.87E+01	2.84E+01	NA	NA	NA	NA
Lindane	Prairie Dog	0.029	1	0	0	0.077	4.26E-01	2.97E+01	2.84E+01	5.00E-02	NA	3.42E+00	NA
Methoxychlor	Prairie Dog	0.029	1	0	0	0.077	3.00E-01	3.13E+01	2.85E+01	2.50E+00	NA	2.29E+02	NA
Methyl Ethyl Ketone	Prairie Dog	0.029	1	0	0	0.077	1.16E+00	2.54E+01	2.86E+01	1.77E+03	NA	4.94E+04	NA
Methyl Methacrylate	Prairie Dog	0.029	1	0	0	0.077	8.99E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Methylene Chloride	Prairie Dog	0.029	1	0	0	0.077	8.86E-01	2.65E+01	2.85E+01	5.85E+00	1.71E+01	2.10E+02	6.13E+02
Methyl-tertbutyl ether	Prairie Dog	0.029	1	0	0	0.077	8.66E-01	2.65E+01	2.85E+01	NA	NA	NA	NA
Napthalene	Prairie Dog	0.029	1	0	0	0.077	4.19E+00	2.84E+01	3.19E+01	5.00E+01	8.66E+01	4.04E+02	7.00E+02
n-Nitrosodiphenylamine	Prairie Dog	0.029	1	0	0	0.077	8.53E-01	2.66E+01	2.85E+01	5.80E+01	1.16E+02	2.15E+03	4.30E+03
n-Nitrosodipropylamine	Prairie Dog	0.029	1	0	0	0.077	8.88E-01	2.64E+01	2.85E+01	NA	NA	NA	NA
Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	Prairie Dog	0.029	1	0	0	0.077	1.01E+00	2.59E+01	2.85E+01	2.70E+01	NA	8.58E+02	NA
Pendimethalin	Prairie Dog	0.029	1	0	0	0.077	3.71E-01	3.03E+01	2.84E+01	2.50E+00	NA	1.93E+02	NA
Pentachlorobenzene	Prairie Dog	0.029	1	0	0	0.077	3.52E-01	3.06E+01	2.85E+01	8.50E-01	NA	6.84E+01	NA

3/0
310

Attachment Table 5

ESL Calculations for Organic ECOIs

			Dietary Proportion				Bioconcentration Factors			Toxicity Reference Values		Ecological Screening Level	
ECOI	Receptor	Ingestion Rate of Food (mg/kg day)	Vegetation	Invertebrate	Small Mammal	Soil in Diet	Soil to Plant	Soil to Invertebrate	Soil to Small Mammal	NOAEL (mg/kg day)	Threshold (mg/kg day)	NOAEL (mg/kg)	Threshold (mg/kg)
Pentachloronitrobenzene	Prairie Dog	0.029	1	0	0	0.077	3.52E-01	3.06E+01	2.85E+01	NA	NA	NA	NA
Pentachloronitrobenzene	Prairie Dog	0.029	1	0	0	0.077	3.52E-01	3.06E+01	2.85E+01	2.00E+02	NA	1.61E+04	NA
Pentachlorophenol	Prairie Dog	0.029	1	0	0	0.077	3.73E-01	3.03E+01	2.84E+01	2.40E-01	7.60E-01	1.84E+01	5.82E+01
Phenol	Prairie Dog	0.029	1	0	0	0.077	8.49E-01	2.66E+01	2.85E+01	4.00E+01	NA	1.49E+03	NA
p-Nitrotoluene	Prairie Dog	0.029	1	0	0	0.077	6.86E-01	2.75E+01	2.84E+01	1.10E+02	1.17E+02	4.97E+03	5.30E+03
Pyrene	Prairie Dog	0.029	1	0	0	0.077	3.70E+00	3.04E+01	3.15E+01	NA	NA	NA	NA
Styrene	Prairie Dog	0.029	1	0	0	0.077	6.01E-01	2.81E+01	2.84E+01	3.00E+01	3.46E+01	1.53E+03	1.76E+03
Sulfotep	Prairie Dog	0.029	1	0	0	0.077	4.57E-01	2.93E+01	2.84E+01	NA	NA	NA	NA
Toluene	Prairie Dog	0.029	1	0	0	0.077	6.56E-01	2.77E+01	2.84E+01	2.60E+01	NA	1.22E+03	NA
Toxaphene	Prairie Dog	0.029	1	0	0	0.077	2.26E-01	3.27E+01	2.86E+01	8.00E+00	NA	9.09E+02	NA
trans-1,2-dichloroethene	Prairie Dog	0.029	1	0	0	0.077	7.55E-01	2.71E+01	2.84E+01	4.52E+01	NA	1.87E+03	NA
Trichloroethene	Prairie Dog	0.029	1	0	0	0.077	6.67E-01	2.77E+01	2.84E+01	7.00E-01	NA	3.24E+01	NA
Trichlorofluoromethane	Prairie Dog	0.029	1	0	0	0.077	7.19E-01	2.73E+01	2.84E+01	NA	NA	NA	NA
Trifluralin	Prairie Dog	0.029	1	0	0	0.077	3.28E-01	3.09E+01	2.85E+01	3.25E+00	NA	2.77E+02	NA
Vinyl acetate	Prairie Dog	0.029	1	0	0	0.077	1.03E+00	2.58E+01	2.85E+01	2.35E+01	NA	7.31E+02	NA
Vinyl Chloride	Prairie Dog	0.029	1	0	0	0.077	8.26E-01	2.67E+01	2.84E+01	1.70E-01	NA	6.49E+00	NA
Xylene (Mixed)	Prairie Dog	0.029	1	0	0	0.077	5.72E-01	2.83E+01	2.84E+01	2.10E+00	2.34E+00	1.12E+02	1.24E+02

Attachment 2
Toxicity Data Used To Derive NOAEL and Threshold Toxicity Reference Values

Analyte	Test Species	Route of Exposure	Vehicle of Administration	Duration of Exposure	Life Stage Test Species	Endpoint	Duration	Units presented in paper (mg/kg-day unless otherwise noted)	Study NOAEL (mg/kg) If Units Must Be Converted	Study LOAEL (mg/kg) If Units Must Be Converted	Body Weight Test Species (kg)	Ingestion Rate Test Species (g/day)	Body Weight and Ingestion Rate Reference	NOAEL (mg/kgday)	LOAEL (mg/kgday)	Effects	LOAEL ECx	Notes	Reference citation
Acenaphthene	Mouse	Gavage	Oil	90 Days	Adult	Survival	Chronic				NA	NA	NA	700	–	No Effects Noted	NOAEL only		EPA 1989a
Acenaphthene	Mouse	Gavage	Oil	90 Days	Adult	Systemic	Chronic				NA	NA	NA	175	350	Increased Liver Weight	Percentage of test group affected not known.		EPA 1989a
Ammonium (as Ammonia)	Rat	Oral	Food	Gestation Day 1-Post Pardum Day 21	Adult/Neonate	Growth	Acute/ Reproduction-Developmental	ppm	200000	–	0.35	17	Nagy 1987	9658	–	No Effects Noted	NOAEL only		Minana et al. 1985
Anthracene	Mouse	Gavage	Oil	90 Days	Adult	Mortality/Systemic	Chronic				NA	NA	NA	1000	–	No Effects Noted	NOAEL only		EPA 1989e
Benzene, 1,2,4-Trimethyl	Rat	Gavage	Oil	4 Weeks	Adult	Mortality	Subchronic				NA	NA	NA	357	1429	Increased Mortality	Percentage of test group affected not known.		EPA 2003b
Benzene, 1,2,4-Trimethyl	Rat	Gavage	Oil	104 Weeks	Adult	Mortality	Chronic				NA	NA	NA	–	457	Increased Mortality	Percentage of test group affected not known.		EPA 2003b
Benzene, 1,3,5-Trimethyl	Rat	Gavage	Oil	90 day - 5 Days/Week	Adult	Growth, Systemic	Chronic				NA	NA	NA	143	429	Decrease in Body Weight	11% decrease in body weight over 90 days.	Recovery after 28 days post exposure.	EPA 2003a
Benzyl Alcohol	Mouse	Gavage	Oil	Gestation Days 6-13	Adult	Reproduction	Acute/Reproduction				NA	NA	NA	–	750	Maternal Mortality	EC38 (19/50 maternal mortality)		Hardin et al. 1987
Benzyl Alcohol	Mouse	Gavage	Oil	Gestation Days 6-13	Adult	Reproduction	Acute/Reproduction				NA	NA	NA	–	750	Decreased Pup Weight	Percentage of test group affected not known.		Hardin et al. 1987
Bromodichloromethane	Rat	Oral	Unknown	10 Days During Gestation	Neonate	Developmental	Acute-Developmental							–	50	Fetal Toxicity	Percentage of test group affected not known.		(ATSDR) Ruddick et al. 1983
Bromodichloromethane	Rat	Oral	Unknown	10 Days During Gestation	Adult/Neonate	Growth/ Reproduction	Acute-Developmental							100	200	Growth and Developmental Effects	50% of individuals had an extra rib. No reproductive effects but some females showed decreased body weight.		(ATSDR) Ruddick et al. 1983
Bromoform	Rat	Gavage	Oil	Gestional Days 6 through 15	Neonate	Developmental	Acute-Developmental							–	50	Fetal Skeletal Abnormalities	Percentage of test group affected not known.		Ruddick et al. 1983
Bromoform	Rat	Gavage	Oil	Gestional Days 6 through 15	Adult/Neonate	Growth/ Reproduction	Acute-Developmental							200	–	Decreased Growth and Reporduction	Percentage of test group affected not known.		Ruddick et al. 1983
Bromomethane (methyl bromide)	Rat	Oral	Food	13 Weeks	Adult	Systemic	Chronic							7.1	35.7	Systemic Effects	Percentage of test group affected not known.	Dose adjusted based on 5 doses per week	Danse et al. 1984
Butylbenzylphthalate	Rat	Oral	Food	6 Months	Adult	Mortality	Chronic				NA	NA	NA	1417	–	No Dose Related Mortality	NOAEL only		NTP 1985a
Butylbenzylphthalate	Rat	Oral	Food	6 Months	Adult	Reproduction	Chronic				NA	NA	NA	470	1417	Testicular Effects	Percentage of test group affected not known.		NTP 1985a
Carbazole	Mouse	Oral	Food	96 Weeks	Adult	Survival	Chronic	% (as well as cumulative g/kg)	–	0.15% diet	NA	NA	NA	–	228	Decreased Survival	EC10 @100 Weeks (25% Mortality in the control vs 35% mortality at the LOAEL)	mg/kg-day calculation from report data.	Tsuda et al. 1982
Carbon disulfide	Rat	Gavage	Oil	Gestation Days 6-15	Adult/Neonate	Developmental	Acute/ Reproduction-Developmental				NA	NA	NA	100	200	Fetal Effects	Percentage of test group affected not known.		Jones-Price 1984
4-Chloroaniline	Rat	Unknown	Unknown	24 Weeks	Adult	Growth and Mortality	Chronic							12.5	25	Increased Mortality and Decreased Body Weight	Percentage of test group affected not known.	12.5 mg/kgday given as dose for 250 ppm dose in food; LOAEL was 500 ppm- extrapolated to 25 mg/kgday dose	NCI 1979b
Chlorobenzene	Mouse	Gavage	Oil	103 Weeks - 5 Days/Week	Adult	Mortality	Chronic				NA	NA	NA	86	–	No Effects Noted	NOAEL only		NTP 1985b
Chlorobenzene	Rat	Gavage	Oil	103 Weeks - 5 Days/Week	Adult	Mortality	Chronic				NA	NA	NA	43	86	Mortality	EC7.5 @78 Weeks (Mortality in make controls = 5% vs 12.5% at the LOAEL)		NTP 1985b
bis(2-Chloroethyl)ether	Rat	Oral	Gavage	78 Weeks	Adult	Survival	Chronic							7.1	14.3	Increased Mortality	35% mortality in the control animals versus 96% in the test group at the LOAEL	Dose adjusted based on 2 doses per week	Weisburger et al. 1981
bis(2-Chloroethyl)ether	Rat	Oral	Gavage	78 Weeks	Adult	Systemic	Chronic							–	7.1	Increased Mortality	Percentage of test group affected not known.	Dose adjusted based on 2 doses per week	Weisburger et al. 1981
bis(2-Chloroisopropyl)ether	Mouse	Unknown	Unknown	2 Years	Adult	Systemic	Chronic							35.8	198	Decreased Hemoglobin Levels	Percentage of test group affected not known.		Mitsumori et al. 1979
2-Chloronaphthalene	Mouse	Unknown	Unknown	13 Weeks	Adult	Systemic	Chronic							250	600	Increase Liver Weight	Percentage of test group affected not known		EPA 1989d
2-Chlorophenol	Rat	Oral	Water	13 Weeks (10 Weeks premating+Gestation Day 1-21)	Adult	Reproduction	Chronic				NA	NA	NA	5	50	Increased in the Number of Still Births and Decreased Litter Size	Percentage of test group affected not known		Exon and Koller 1982 and 1985
2-Chlorophenol	Rat	Oral	Water	10 Weeks premating + Gestation Days1-21+ Post Natal Days 1-21	Adult and Neonate	Developmental	Chronic				NA	NA	NA	50	–	No Effects Noted	NOAEL Only		Exon and Koller 1981
2-Chlorophenol	Rat	Oral	Water	16 Weeks; Gestation Days 1-21+ Post Pardum Days 1-91	Neonate	Developmental	Chronic				NA	NA	NA	50	–	No Effects Noted	NOAEL Only		Exon and Koller 1983 and 1985
2-Chlorophenol	Rat	Oral	Water	27 Months (premating through 2 years)	Adult	Systemic	Chronic				NA	NA	NA	50	–	No Effects Noted	NOAEL Only		Exon and Koller 1985
4,4-DDD	Mouse	Oral	Food	78 Weeks	Adult	Mortality	Chronic	ppm diet	822	–	0.027	3.98	Nagy 1987	121	–	No Effects Noted	NOAEL only		NCI 1978c
4,4-DDD	Rat Osborne Mendel-male	Oral	Food	78 Weeks	Adult	Mortality	Chronic	ppm diet	3294	–	0.46	19.7	Nagy 1987	141	–	No Effects Noted	NOAEL only		NCI 1978c
4,4-DDD	Rat Osborne Mendel-male	Oral	Food	78 Weeks	Adult	Mortality	Chronic	ppm diet	1700	–	0.31	15.8	Nagy 1987	87	–	No Effects Noted	NOAEL only		NCI 1978c
4,4-DDE	Rat	Gavage	Oil	Gestation Days 14-18	Neonate	Developmental	Acute/Reproduction				NA	NA	NA	10(M)	50(M)	Reduced Anogen Distance	Percentage of test group affected not known.		Loeffler & Peterson 1999
4,4-DDE	Rat	Gavage	Oil	Gestation Days 14-18	Neonate	Developmental	Acute/Reproduction				NA	NA	NA	10	100	Reduced Anogen Distance	Percentage of test group affected not known.		You et al. 1998
4,4-DDE	Mouse B6C3F1 female	Oral	Food	78 Weeks	Adult	Mortality	Chronic	ppm diet	148	261	0.027	4.0	Nagy 1987	22	39	No Effects Noted	~EC20 90 Weeks (~5% control vs 25% high dose Mortality); EC35 @110 Weeks termination of study		NCI 1978c
4,4-DDE	Rat	Oral	Food	78 Weeks	Adult	Mortality	Chronic	ppm diet	242	462	0.38	17.7	Nagy 1987	11	22	No Effects Noted	EC35 compared with control mortality- female		NCI 1978c
4,4-DDE	Rat	Gavage	Oil	Gestation Days 14-18	Adult	Reproduction	Acute/Reproduction				NA	NA	NA	–	100(M)	Male Gonadal Changes	Percentage of test group affected not known.		Gray et al. 1999
4,4-DDE	Rat	Gavage	Oil	Gestation Days 14-18	Adult	Reproduction	Acute/Reproduction				NA	NA	NA	–	100(M)	5 Day Puberty Delay	Percentage of test group affected not known.		Kelce et al. 1995
Dibenzofuran	Rat	Oral	Food	200 Days	Adult	Growth	Chronic	assume ppm	0.4	–	NA	NA	NA	400	–	No Effects Noted	NOAEL only	Adjusted by IRIS reviewer to 0, 12.5, 25, 50, 100, 200 and 400 mg/ kg-day	Thomas et al. 1940
Dibenzofuran	Rat	Oral	Food	200 Days	Adult	Systemic	Chronic	assume ppm	0.025	0.05	NA	NA	NA	12.5	25	Kidney Histopathology	Percentage of test group affected not known.	Low confidence in study given age and documentation provided.	Thomas et al. 1940
Dibromochloromethane	Rat	Gavage	Oil	9 days (Gestational Days 6-15)	Adult	Growth	Acute - Developmental				NA	NA	NA	100	200	Decrease in body weight and growth.	The percentage of test group affected is unknown.		Ruddick et al. 1983
Dicamba	Rabbit	Gavage	Not Specified	Gestation Days 6-18	Adult	Reproduction/ Developmental	Acute - Developmental and Reproduction				NA	NA	NA	3	10	Reduced Fetal Weight and Increase in Fetal Resorption	Percentage of test group affected not known.		Velsicol 1978
Dicamba	Rat	Oral	Food	2 Years	Adult	Systemic	Chronic				NA	NA	NA	125	–	No Effects Noted	NOAEL only		Vesicol 1985
Dicamba	Rat	Unknown	Unknown	Unknown	Adult-Neonate	Reproduction/ Developmental	Acute - Developmental and Reproduction				NA	NA	NA	160	400	Decreased Body Weight and Increased Maternal Mortality	Percentage of test group affected not known.		Vesicol 1981
Dicamba	Rat	Unknown	Unknown	3 Generations	Adult-Neonate	Reproduction/ Developmental	Chronic				NA	NA	NA	25	–	No Effects Noted	NOAEL only		Vesicol 1981
1,2-Dichlorobenzene (o-)	Rat	Unknown	Unknown	2 Years	Adult	Survival	Chronic							42.9	85.7	Decreased Survival in Male Rats.	Percentage of test group not known		NTP 1987
1,4-Dichlorobenzene (p-)	Rat	Gavage	Oil	Gestation Day 6-15	Adult	Reproduction	Acute/Reproduction				NA	NA	NA	250	500	Decreased Maternal Body Weight	Percentage of test group affected not known.		Giavini et al. 1986

255